OCTOBER 1919.] [Price 6s.

# PROCEEDINGS

OF THE

# LINNEAN SOCIETY OF LONDON.

## 131st SESSION.

FROM NOVEMBER 1918 TO JUNE 1919.

LONDON:
PRINTED FOR THE LINNEAN SOCIETY,
BURLINGTON HOUSE, PICCADILLY, W.1,
BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

# Roll of Honour.

## 1914—1918.

WILFRID OMER COOPER
(1895—1916).

ERNEST LEE
(1886—1915).

CUTHBERT ST. JOHN NEVILL
(1889—1918).

EDWIN EPHRAIM RISELEY
(1889—1917).

MARC ARMAND RUFFER
(1859—1917).

GEOFFREY WATKINS SMITH
(1881—1916).

SIDNEY MILES TOPPING
(1875—1917).

EDWARD JOHN WOODHOUSE
(1884—1917).

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1919.

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# CONTENTS.


| | Page |
|---|---|
| List of Publications issued | iv |
| Proceedings of the 131st Session | 1 |
| Presidential Address | 22 |
| Obituaries | 39 |
| Abstracts of Papers | 70 |
| Additions to the Library | 81 |
| Benefactions, 1790–1919 | 101 |
| Index | 112 |

PUBLICATIONS: Session July 1918–July 1919.

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List of [Fellows, Associates, and Foreign Members], Nov. 1918.

# PROCEEDINGS

OF THE

# LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND THIRTY-FIRST SESSION, 1918–1919.)

November 7th, 1918.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 20th June, 1918, were read and confirmed.

The President announced that he had appointed Mr. R. I. Pocock, F.R.S., to be a Vice-President.

The President declared the Meeting made special in accordance with the notice circulated on the 28th October last, in order to elect a Councillor to fill the vacancy in the Council caused by the death of the late Prof. Henry George Plimmer, F.R.S. He announced that the Ballot would remain open until 5.30 p.m.

The General Secretary having read the Bye-Law (Ch. VIII. sect. 11) governing a bye-election, the Fellows present proceeded to vote.

The President appointed Mr. James Small, Miss E. F. Noel, and Mr. W. C. Worsdell, Scrutineers, and these having examined the Balloting papers, reported to the President, who declared that Mr. Arthur Warwick Sutton had been duly elected a Councillor.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Lester Vallis Lester-Garland, M.A. (Oxon.), was re-admitted a Fellow.

Mr. Charles Cuthbert Eley, J.P., M.A.(Oxon.), Mr. Gordon Wallace Gibson, Miss Gladys Boyd Hurry, Mr. John Hutchinson, Mr. Francis Edward Robotham, Mr. Arthur Rufus Sanderson, Dr. John McLean Thompson, M.A., Mr. William Arthur Wilkinson, F.Z.S., and Mr. William Edgar Wright, Lt. R.A.F., were proposed as Fellows.

The first paper was entitled "On the External Morphology of the Stems of *Calamites*, with a Revision of the British Species of *Calamophloios* and *Dictyocalamites* of Upper Carboniferous Age." By the late E. A. Newell Arber, M.A., Sc.D., F.L.S., and F. W. Lawfield, B.A. (Communicated by Mrs. Arber, D.Sc., F.L.S.)

Dr. D. H. Scott remarked upon certain of the photographs which had been shown on the screen by Mr. Lawfield, who had summarized the results obtained; Prof. M. J. Benson also contributed a few remarks, and Mr. Lawfield replied.

The second paper was by Mrs. Arber, D.Sc., F.L.S., styled "The 'Law of Loss' in Evolution."

A discussion followed in which the following took part:—Dr. D. H. Scott, Prof. F. W. Oliver, Dr. W. Bateson, Dr. A. Smith Woodward, Mr. E. S. Goodrich, Sec.L.S., Dr. Marie Stopes, Mr. W. C. Worsdell, Mr. A. J. Wilmott, Mr. T. A. Dymes, and Dr. E. J. Salisbury, the Author briefly replying.

November 21st, 1918.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 7th November, 1918, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The Rev. Canon George Russell Bullock-Webster, M.A., was admitted a Fellow.

Mr. Robert William Ascroft, M.B.E., Mr. William Broadhurst Brierley, M.Sc., the Rev. Charles Osborne Smeathman Hatton, B.A.(Cantab.), and Mr. Harold John Hastings Russell, B.A., F.Z.S., were proposed as Fellows.

Mr. Horace Norman Gray, Mr. Wilfred Edward Hiley, M.A. (Oxon.), and Sir Nicolas Yermoloff, K.C.B., K.C.V.O., were elected Fellows.

The Treasurer exhibited a new volume purchased out of the Tagart Fund, Berlese's 'Gli insetti,' Vol. I.

Mr. E. S. Goodrich, F.R.S., Sec.L.S., exhibited "A fatherless Frog, with remarks on Artificial Parthenogenesis." He remarked on the artificial development of echinoderm eggs by special treatment into living examples, and that it had been found that frogs' eggs could follow a similar course. A female frog, carefully prepared to guard against previous impregnation, was employed, the eggs obtained by dissection were placed in rows upon glass slips, and punctured by fine glass needles of microscopic tenuity; blood was then applied, and the treated eggs placed in water. A certain number developed into tadpoles and a few into complete frogs. It was found that the leucocytes in the blood were essential; the serum or ordinary red corpuscles were useless.

Dr. Harold Wager, Miss Madeline Carson, and Dr. J. R. Leeson engaged in a short discussion.

Miss Muriel Bristol, M.Sc., then read her paper, "A Review of the Genus *Chlorochytrium*, Cohn," communicated by Prof. G. S. West, D.Sc., F.L.S., and illustrated by lantern-slides.

The following engaged in the discussion:—Dr. Harold Wager, Dr. E. Marion Delf, Mr. Robert Paulson, Miss A. C. Halket; and the Author replied.

Mr. B. B. Woodward briefly epitomized the last paper, which was entitled:—

"On the Linnean species of Non-Marine Mollusca that are represented in the British Fauna, with Notes on the specimens of these and other British forms in the Linnean collection." By A. S. Kennard, F.G.S., and B. B. Woodward, F.L.S.

The paper concludes with a detailed enumeration.

December 5th, 1918.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 21st November, 1918, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President put a Motion expressing the sense of loss experienced by the Society in the recent death of Mary Emily Bessie Smith, B.Sc., Clerk to the Society since March 1917, and of sympathy with Mrs. Smith in her bereavement.

This was unanimously adopted, the Fellows rising in their places.

Sir Nicolas Yermoloff, K.C.B., K.C.V.O., was admitted a Fellow.

Miss Kathleen Maisey Curtis, M.A., M.Sc., was proposed as a Fellow.

Mr. Charles Cuthbert Eley, J.P., M.A. (Oxon.), Mr. Gordon Wallace Gibson, Miss Gladys Boyd Hurry, Mr. John Hutchinson, Mr. Francis Edward Robotham, Mr. Arthur Rufus Sanderson, Dr. John McLean Thompson, M.A., Mr. William Arthur Wilkinson, F.Z.S., and Mr. William Edgar Wright, Lt.R.A.F., proposed as Fellows on the 7th November last, were severally elected.

The first paper was by Prof. W. A. Haswell, F.R.S., F.L.S., on the Exogoneæ, which was summarized on behalf of the Author by Mr. E. S. Goodrich, F.R.S., Sec.L.S.

Mr. C. D. Soar, F.L.S., exhibited a large series of coloured drawings of British Mites, and showed lantern-slides in elucidation.

Mr. E. S. Goodrich and Mr. T. A. Dymes contributed some additional remarks.

The General Secretary showed a framed engraving of Carl von Linné, engraved by Chapman and published in 1812: of this we had no copy, the gift being an accession to the Society's collection of Linnean portraits. It was presented by the sons of our recently deceased Fellow, Dr. John William Sinclair Meiklejohn.

He also exhibited the letters from Governor Tulbagh, translated and published in the latest part of the Society's 'Proceedings,' and gave further details which had come to his knowledge since the introductory remarks had been written. He regretted that so little was known of this excellent administrator of the Dutch Colony of the Cape, but pointed out that Carl Pehr Thunberg, the celebrated Swedish botanist and traveller, had, in his published travels, thrown some light upon Tulbagh's record. Thus he mentions that the future Governor came to the Cape as a private soldier of the colonial garrison, but gradually rose by simple merit to the highest position in the Colony, dying of "gout and old age" in 1771, after twenty years of service as Governor. During this term he had to contend with two epidemics of small-pox, introduced from vessels touching at Cape Town, but he was able to send out exploring expeditions to the north, and to the east as far as Natal.

Some of the difficulties of the editor were enumerated, and displayed upon the black-board.

Mr. C. C. Lacaita gave a similar instance of an Italian botanist persisting in writing in a local dialect.

January 16th, 1919.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 5th December, 1918, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Wright Smith, Miss Gladys Boyd Hurry, Mr. Charles Cuthbert Eley, J.P., M.A.(Oxon.), Mr. William Arthur Wilkinson, F.Z.S., Mr. Wilfred Edward Hley, M.A.(Oxon), Mr. Francis Edward Robotham, and Mr. John Hutchinson were admitted Fellows.

The following were severally balloted for and elected Fellows:—Robert William Ascroft, M.B.E.; William Broadhurst Brierley, M.Sc.; the Rev. Charles Osborne Smeathman Hatton, B.A.(Cantab.); and Harold John Hastings Russell, B.A., F.Z.S.

A vacancy for an Associate caused by the death of James Eustace Bagnall was announced from the Chair.

An account was given by Capt. A. W. Hill, F.L.S., of the horticultural work that had been carried out in the military cemeteries in France since 1916, when such work first became possible; reference was also made to the cemeteries in the Italian and other theatres of war.

It is intended to make the cemeteries, as far as possible, smooth well-kept grass-lawns, surrounded by hedges of thorn, beech, or hornbeam, with groups, avenues, or pole-hedges of trees, such as Siberian crabs, limes, hornbeams, willows, etc., and to plant on the graves rose-bushes, *Iris*, and other dwarf carpeting-plants.

Steps are being taken as far as possible to mark the cemeteries where Canadian, Australian, New Zealand, Indian, and other Overseas soldiers lie buried with plants native to the countries whence they came to the defence of the Empire.

Allusion was made to the problems which have to be faced in

the matter of soil and site, which often render successful gardening work very difficult. Some of the cemeteries are in very sandy places, others in chalk, whilst a number are in the fenland of the Belgian border.

The results so far obtained have proved that, given proper care, whatever the soil may be, a good turf can be formed in Northern France. In the cemeteries where permanent planting is not yet possible good results have been obtained by sowing annuals, either according to a well-arranged colour-scheme or in mixture, and the effect in summer has been quite beautiful and much appreciated by our soldiers in the field. Bulbs have been extensively planted.

Nurseries have been established for the supply of plants, trees, and shrubs to the numerous cemeteries.

A series of slides was shown of cemeteries in various parts of France, some situated in old orchards, some in sandy districts, and others in the open country, and from them a good idea was obtained of the care and labour bestowed by the Officers and gardening N.C.Os. and Privates attached to the Imperial War Graves' Commission in France.

Mr. Gerald Loder, Mr. Arthur W. Sutton, Mr. C. C. Lacaita, and the President engaged in a discussion, and Capt. Hill replied to certain questions which were put.

On the motion of the President, a hearty vote of thanks was given to the lecturer.

February 6th, 1919.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th January, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Harold John Hastings Russell and Mr. William Broadhurst Brierley were admitted Fellows.

The following were proposed as Fellows:—Mr. Herbert Henry Corbett, Mr. Frank Cornish, Mr. Charles Ethelbert Foweraker, M.A., Mr. Hazlehurst Greaves, Mr. Paul Kestner, Mr. John McLuckie, M.A., B.Sc.(Glasg.), Mr. William Edward Nicholson, Mr. Pheroshaw Jamsetjee Panday, B.A.(Oxon.), and the Rev. William Walter Watts.

Mr. William Robert Sherrin was proposed as an Associate.

Miss Kathleen Maisey Curtis, M.A., M.Sc., D.I.C., was elected a Fellow.

The President read from the Chair the following proposed alterations in the Bye-Laws, and explained the reasons for them.

The first Section of Chapter I. and the second Section of Chapter VIII. to be repealed, and the following substituted:—

CHAPTER I.

*Section I.*—The number of Fellows shall be limited to Seven Hundred and Ten, exclusive of Honorary Members, Foreign Members, and Associates. The method of Election shall be by Ballot.

CHAPTER VIII.

*Section II.*—The Council for the time being shall, before the day of Election, prepare Balloting Papers with lists of the Persons whom they recommend to the Society to be elected as Council and Officers for the ensuing year.

In reply to questions asked by Mr. H. R. Darlington and Mr. Gerald Loder, the General Secretary explained the method of altering Bye-Laws as laid down in the original Charter, the proposed alterations being read from the Chair at two General Meetings, and submitted to a Ballot of the Fellows at a third Meeting.

Two papers by Mr. N. E. BROWN, A.L.S., were read in his absence, owing to his recent illness, namely: (1) "A new species of *Lobostemon* in the Linnean herbarium"; (2) "Old and new species of *Mesembryanthemum*, with critical remarks."

The first was explained by the General Secretary from the author's MS.; and Dr. A. B. Rendle read the introductory part of the second paper, giving the history of the genus *Mesembryanthemum*.

Dr. R. R. Gates and the President contributed further remarks, especially upon the extermination of rare species in consequence of the present system of farming in South Africa.

February 20th, 1919.

Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 6th February, 1919, were read and confirmed.

The report of the Donations received since the last Meeting

was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Edgar Wright, Lieut. R.A.F., was admitted a Fellow.

The death of Dr. Anne Casimir Pyramus de Candolle, F.M.L.S., on the 3rd October, 1918, was announced from the Chair.

The President read from the Chair the proposed changes in the Bye-Laws for the second time.

Mr. C. E. Salmon, F.L.S., exhibited and commented upon a series of water-colour drawings of the highest finish, the names as furnished by the artist, Mr. T. A. Stephenson, of Aberystwyth, being, *Malaxis paludosa*, Sw.; *Corallorrhiza innata*, R. Br.; *Epipactis atrorubens*, Roehl.; *E. latifolia*, All.; *E. viridiflora*, Reichb., with its two varieties *dunensis*, Weld. & Trav., and *vectensis*, Stevens; *Orchis purpurea*, Huds.; *O. incarnata*, Linn., and its variety *dunensis*, Druce; *O. prætermissa*, Druce; *O. latifolia*, Linn.?; *O. Fuchsii*, Druce (the old *O. maculata*, auct. angl.); *O. maculata*, Linn., now employed for previously-named var. *præcox*, Webster, and *O. ericetorum*, Linton; *O. maculata* var. *insignis*, Steph.; *O. O'Kellyi*, Druce; hybrids of *O. Fuchsii* and *O. maculata* crossed with *Habenaria conopsea*, R. Br. (=*Orchigymnadenia Heinzeliana*, Camus), and *O. Evansii*, Druce; *Ophrys apifera* var. *Trollii*, Heg.; *Habenaria chlorantha*, Bab.; *H. viridis*, R. Br.; *H. viridis* × *conopsea*, Benth.; and *H. intacta*, Benth.

Mr. E. G. Baker, Mr. F. N. Williams, Mr. C. C. Lacaita, and Mr. W. B. Brierley took part in the discussion which followed.

Mr. E. S. Goodrich, F.R.S., Sec.L.S., then spoke of the exquisite drawings of sea-anemones, also executed by Mr. Stephenson in water-colour, shown, and understood to be destined for a forthcoming volume on that group.

Mr. R. H. Burne, F.L.S., showed a series of preparations by the late Prof. Charles Stewart, F.R.S., Pres.L.S. 1890-94, of sound-producing organs in Invertebrates and Fishes. He classified sound-organs as (1) Rattles, as in the Rattlesnake; (2) Stridulating organs, as in the Grasshoppers; (3) a Drum-membrane actuated by a muscle, as in Cicadas and Fishes; and (4) Membranes vibrated by a current of air, as in the vocal organs of Vertebrates.

A discussion followed, in which Lieut.-Col. Tull Walsh, who instanced an Indian species of *Mygale* stridulating, Mr. E. S. Goodrich, F.R.S., Sec. L.S., Mr. H. N. Dixon, and Dr. G. B. Longstaff engaged.

Mr. E. G. Baker, F.L.S., showed drawings by Miss Beatrice O. Corfe of British plants, namely, *Sagittaria*, *Ruscus*, *Carlina*, *Fraxinus*, and *Butomus*, part of a series now being prepared for the Department of Botany, British Museum.

Dr. A. B. Rendle, F.R.S., Sec.L.S., remarked that Miss Corfe had shown a special faculty for taking advantage of hints, and had acquired a facility in analysing the flowers, which resulted not only in admirably artistic productions but in very satisfactory botanic illustrations.

The General Secretary reminded the Fellows that Miss Corfe had exhibited a series of her beautiful and accurate drawings on the 15th December, 1910 (Proc. 1910–11, p. 4).

## March 6th, 1919.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 20th February, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Wellington Ernest Groves and Mr. William Bernard Crow were admitted Fellows.

Mr. William Charles Barton, B.A.(Oxon.), and Mr. Wilfrid Rushton, A.R.C.S., D.I.C., were proposed as Fellows.

Dr. Johan Nordal Fischer Wille, Professor of Botany in Christiania University, was proposed as a Foreign Member.

The following were balloted for and elected Fellows:— Mr. Herbert Henry Corbett, Mr. Frank Cornish, Mr. Charles Ethelbert Foweraker, M.A., Mr. Haslehurst Greaves, Mr. Paul Kestner, Mr. John McLuckie, M.A., B.Sc. (Glasg.), Mr. William Edward Nicholson, Mr. Pheroshaw Jamsetjee Panday, B.A. (Oxon.), and the Rev. William Walter Watts. Mr. William Robert Sherrin was elected an Associate.

The President then read the proposed alterations in the Bye-Laws for the third time, and again explained the reasons which induced the Council to prepare these proposals. He was followed by the Treasurer, who showed that the adoption of these proposals would be advantageous from the financial point of view: and further stated that the number of Fellows was at that moment 702.

Two ballot-boxes were used, and the proposed alterations were separately voted for by chapters, and adopted (see p. 7).

Dr. Harold Wager, F.R.S., F.L.S., then delivered a lecture, entitled, "On the Colour-sense of Wasps." He stated that the experiments described in his paper were made by observing the number of wasps flying towards, and settling upon, pieces of sugar placed upon sheets of coloured paper arranged in various ways.

The results of the experiments show that in seeking their food wasps (*Vespa vulgaris*) are guided by their social instinct, their remembrance of locality, and their power to distinguish conspicuous colours or colour-contrasts. They are probably also guided by smell, but no experiments were made to test this.

Under the conditions of the experiments wasps were attracted by the strong colour-contrasts of white sugar on yellow, red, or black paper, and less strongly by the weaker colour-contrasts of white sugar on blue or white paper. They showed very little discrimination among the various colours, but, so far as could be judged, when they had a more or less free choice, untrammelled by their stronger instincts, they flew to the colours in the following order: yellow, black, red, blue, white.

The wasps in the experiments showed a very pronounced tendency to come back always to the exact place where they had previously obtained sugar, irrespective of any colour that might happen to be there. When the sugar was removed only a short distance away they were much puzzled, and only after flying about for some time were they able to discover it in its new place.

Their social instincts were clearly indicated by the fact that they were always more strongly attracted by other wasps than by place or colour. This attraction for other wasps was so strong that they would frequently fly at first to a piece of sugar surrounded by dead wasps in preference to other pieces of sugar in the immediate neighbourhood which were free of wasps. However, they very rarely settled on a piece of sugar surrounded by dead wasps.

Leaving out of account the probability that smell plays an important part in their activities, these experiments indicate that the governing principles which dominate wasps in their search for food are, in the first place, the attraction exerted by the presence of other wasps; secondly, the tendency always to return to the same place; and, thirdly, the attraction due to conspicuous colours and colour-contrasts.

The lecture was illustrated by drawings on the blackboard and some lantern-slides.

Dr. Harry Eltringham, F.Z.S. (visitor), gave an account of his experiments on the colour-sense of Lepidoptera, with several coloured lantern-slides; Sir Henry Howorth, F.R.S. (visitor), and Dr. G. B. Longstaff continued the discussion, the latter giving instances from the behaviour of butterflies in the Tropics.

Dr. Wager excused himself from replying on account of the lateness of the hour.

The paper by Mr. F. Lewis was postponed.

March 20th, 1919.

Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 6th March, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Pheroshaw Jamsetjee Panday, B.A.(Oxon.), was admitted a Fellow, and Mr. William Robert Sherrin an Associate.

Mr. Frederick Ormrod Mosley, Miss Dora Lawson, B.Sc. (Liverp.), and Mr. Humphrey Godwin Billinghurst were proposed as Fellows.

The President announced that the number of Fellows now stood at 701, and that 5 candidates having been proposed, the number of vacancies in the Fellows' List is reduced to four.

The first paper, by Mr. FREDERICK LEWIS, F.L.S., "Notes on a Visit to Kunadiyaparawita Mountain, with a List of the Plants obtained, and their Altitudinal Distribution," was read by the Botanical Secretary.

This curious mountain is nearly due west of the sacred "Adam's Peak," and rises abruptly to an altitude of 5186 feet above the sea, and is surrounded by forest. The summit is small in extent, surrounded by precipices, in the path of the S.W. monsoon, which strikes on this isolated peak and by its force dwarfs the vegetation on it. The annual rainfall on the eastern base is about 230 inches, that on the western side about 330 inches.

The flora appears to be largely endemic, animal life is practically absent, and wind transport of seeds of those plants which are on the summit seems unlikely. Forty-nine plants were collected on the mountain top in one day's visit, and were determined at Peradeniya, and the names are appended to the paper; of these ten only are found outside Ceylon, the remainder being endemic.

Dr. Bateson added some observations, and the President gave an account of his visits to two islands off the Indian coast. On one of these, Barren Island in the Andaman group, he found that *Terminalia Catappa*, which usually grows close to the sea, extending to the top of the outer cone, apparently due to the rats feeding on the fruit (the "Country Almonds" of Anglo-Indian speech), which, when disturbed, they carried in their mouths up the slopes.

Miss M. Rathbone exhibited a series of specimens preserved by submitting them to the action of formalin vapour, as shown in the following statement:—

Some years ago it occurred to me to try to find some method of preserving plants which would not destroy either their form or colour. I began by trying liquid paraffin, and this at first gave very promising results; but after a time the specimens became mouldy, and, if antiseptics such as salicylic acid were added, the colour disappeared.

It then occurred to me to try formalin vapour, hoping that in this way the tissues of the plants might be hardened, and at the same time that the colour might be preserved. Unfortunately, as these specimens show, the results have fallen far short of my ideal! The colour fades after a time, and the stalks and petals often become limp. However, in plants preserved in this way, the microscopic characters of the tissues and the form of the flower and relationship of its parts are less altered than in dried specimens, whilst for travellers specimens preserved in this way are lighter and more convenient to carry than plants preserved in spirit.

I found that it was best to dilute the formalin with water (one part formalin to one or two parts of water), and possibly an even weaker solution might answer. Cotton-wool soaked in this solution is put at the bottom of the bottle, or it may be tied round the stalks of the plants, enough being used to ensure a damp atmosphere. Of course the bottles or boxes in which the plants are kept ought to be air-tight, and I found that candle-grease dropped over the cork answered very well.

These plants were bottled in 1917, as last summer I was moving about and not able to make any further experiments. I have also brought a bottle of African Marigold in salicylic acid and liquid paraffin, bottled in 1912. It was quite the best of my paraffin specimens, most of which are deplorable objects, and I do not think there is much to be said for this method, as it has all the drawbacks of alcohol and none of its advantages.

As regards formalin, I might add that I have found that a 1/10 solution in water is quite good for freshwater Algæ. I have some bottled in 1911, in which the chlorophyll body in *Spirogyra*, which shrivels up so easily with most reagents, still shows quite distinctly.

The experiments were carried on rather under difficulties, as I was busy with war-work in a rather out-of-the-way place and it was not very easy to get suitable bottles and other materials, to say nothing of flowers, which were not very plentiful in that locality; but I thought that some of the other Fellows of the Society might like to try this method in spite of its drawbacks, and I also hoped that somebody might be able to suggest improvements in the technique.

The following engaged in the subsequent discussion:—Mr. E. G. Baker, Mr. F. N. Williams, Mr. J. C. Shenstone, Mr. G. C.

Walton, Dr. A. B. Rendle, Dr. E. Marion Delf, Mr. W. B. Brierley, and the President.

The last communication was by Mr. H. R. Amos, communicated by Dr. W. Bateson, on the work done in the Argentine by Mr. W. O. Backhouse and himself in breeding wheats suitable for the country and its diverse climates, the northern portion being warmer than the southern, which is subject to occasional frost—consequently their requirements are not the same. The lecturer explained the results of crossing "Barletta" and "Rieti," both commonly cultivated forms in the Argentine, with a Russian variety, others between a Chinese form and Barletta, with a view of obtaining forms immune to Rust and not liable to shell out the grain on harvesting.

Lantern-slides were shown, testifying to the success obtained.

Dr. Bateson followed, pointing out the value and importance of the investigation.

April 3rd, 1919.

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 20th March, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Charles Ethelbert Foweraker, M.A., and Miss Kathleen Maisey Curtis, M.A., M.Sc., D.I.C., were admitted Fellows.

Mr. Alfred William Sheppard, Miss Mary Rebekah Norris Holmer, M.A., and Miss Theodora Lisle Prankerd, B.Sc.(Lond.), were proposed as Fellows.

Mr. William Charles Barton, B.A.(Oxon.), and Mr. Wilfrid Rushton, A.R.C.S., D.I.C., were elected Fellows.

The following Auditors for the Treasurer's Accounts were elected by show of hands:—For the Council: Mr. Arthur W. Sutton and Mr. Stanley Edwards; For the Fellows: Mr. Gerald W. E. Loder and Mr. Robert Paulson.

The President announced that the number of Fellows now stood at 703, and that six candidates having been proposed there remains but one vacancy.

The first paper, on "An Albino Mutant of *Botrytis cinerea*, Pers.," was read by Mr. WILLIAM B. BRIERLEY, M.Sc., F.L.S., and illustrated with preparations and lantern-slides.

Dr. W. Bateson, Mr. A. D. Cotton, and Dr. Ethel Thomas took part in a discussion, and the Author replied.

The second paper, by Dr. J. D. F. GILCHRIST, F.L.S., on "The post-Puerulus Stage of *Jasus lalandii* (Milne-Edw.), Ortmann," was epitomized by Mr. E. S. Goodrich, Zoological Secretary.

This paper carried on the investigation already published in our Journal, Zoology, vol. xxxiii. (1916) pp. 101–125, pls. 12–17, with 12 text-figures, as "Larval and Post-Larval Stages of *Jasus lalandii*," etc.

The last paper, "Variation in Flowers of *Jasminum malabaricum*, Wight," by Dr. H. H. MANN, F.L.S., was explained by Dr. A. B. Rendle, Botanical Secretary.

A discussion followed in which Dr. E. J. Salisbury, Mr. C. C. Lacaita, and Dr. A. B. Rendle took part.

May 1st, 1919.

Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 3rd April, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The following motion was put from the Chair and adopted in silence, all upstanding in their places:—

> That the Linnean Society of London having heard with the deepest sorrow of the death of Sir FRANK CRISP, Bt., for twenty-four years Treasurer, and for nearly forty-nine years a Fellow, of this Society, desire to record their sense of the invaluable services rendered by him during the whole period of his Fellowship for the benefit of the Society, and their realization of the loss sustained in his death.

Mr. Wilfrid Rushton, A.R.C.S., Mr. William Charles Barton, B.A.(Oxon.), Mr. William Edward Nicholson, Miss Edith Grey Wheelwright, and Mr. James Montagu Frank Drummond, B.A. (Cantab.), were admitted Fellows.

Mr. Edgar Beckett, Dr. Sidney Frederic Harmer, M.A., F.R.S., F.Z.S., and Miss Florence Annie Mockeridge, D.Sc., were proposed as Fellows.

Mr. Frederick Ormrod Mosley, Miss Dora Lawson, B.Sc. (Liverp.), and Mr. Humphrey Godwin Billinghurst were elected Fellows, and Dr. Johan Nordal Fischer Wille a Foreign Member.

Mr. James Small, M.Sc., F.L.S., gave a demonstration of the various forms assumed by the pappus in Compositæ, of which the following is his abstract:—

Stating the case for the trichome nature of the pappus in this family as briefly as possible, we have six points.

1. The development of the members of the pappus is either that of a typical trichome (from one epidermal cell) or that of an emergence, such as the spines of a thistle.

2. The structure of the mature pappus is that of a series of hairs which have become fused throughout all or a part of their length, either side by side to give a scale or in a mass to give an awn.

3. The similarity of the setæ to the achenial hairs is very marked.

4. The primitiveness of the scabrid seta is in conformity with the evolution of the family as deduced from other data.

5. The predominant type of pappus in the fossil forms is the setose type. No fossil paleaceous pappus is known.

6. The presence of a pappus is correlated or linked with the presence of achenial hairs.

Reduction of both characters is also linked, *e.g.*, reduction of the elater hairs of the achene in the Anthemideæ to special epidermal cells is accompanied by reduction of the pappus to the coroniform type. The same applies to some cases in the Cichorieæ.

As all the facts adduced in support of the phyllome theory can be easily and adequately explained by assuming that the pappus in certain cases is partly a development of the hairs which were inserted on the now aborted but once free calyx-segments, the evidence in favour of the trichome or emergence nature of the organ admits of no other conclusion than that which takes the pappus to be hairs, free or fixed, derived in their evolution from the hairs of the achene, or sometimes also from the hairs of the now aborted calyx-limb.

A discussion followed, in which Prof. J. B. Farmer, Dr. Stapf, Mr. W. C. Worsdell, Dr. D. H. Scott, Dr. A. B. Rendle, and Mr. T. A. Dymes engaged, and the Author replied.

Mr. J. Montagu F. Drummond then gave an account of his paper on the Flora of a small area in Palestine.

May 24th, 1919.

*Anniversary Meeting.*

Sir David Prain, C.M.G., C.I.E., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st May, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. George Michael Ryan and Miss Dora Lawson, B.Sc., were admitted Fellows.

Certificates in favour of the following candidates were read :— Robert Swainson-Hall, Cyril Tenison White, Edwin Ashby, Prof. Vernon Herbert Blackman, F.R.S., William Thomas Calman, D.Sc., Robert Colquhoun McLean, D.Sc., Arthur Robert Thompson, Miss Mary Rose Hall Thomson, Humphrey John Denham, B.A.(Oxon.), Ethelbert Ambrook Southee, and Benaiah Colson Adkin, M.A.(Cantab.).

The number of Fellows was stated to be 698, leaving 12 as the number of vacancies existing.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 19–21), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely :—

27 Fellows.

Syed Khurshaid Ahmed.
Senjee Pulney Andy.
Dr. Edward Alexander Newell Arber.
William Edward Balston.
Claude Keith Bancroft.
Richard Hawksworth Barnes.
Frederick James Bridgman.
Sir Frank Crisp, Bt.
Rt. Hon. Baron Forrest of Bunbury, P.C., G.C.M.G.
Rt. Hon. Sir Edward Fry, P.C., G.C.B.
Frederick Du Cane Godman.
Mark W. Harrington.
Henry Robert Knipe.
John Henry Lace, C.I.E.
Robert Laurie.
Alberto Löfgren.
John William Sinclair Meiklejohn.
Charles Smith Nicholson.
Rev. Canon Alfred Merle Norman.
Prof. Henry George Plimmer.
William Denison Roebuck.
Richard Williams Harold Row.
William Wardlaw Thompson.
Alexander Horsburgh Turnbull.
William Henry Wilkinson.
Henry Worsley Seymour Worsley-Benison.
Rev. Lawson Sant Wright.

1 Foreign Member.

Dr. Anne Casimir Pyramus de Candolle.

2 Associates.

James Eustace Bagnall.

Frederick Herschel Waterhouse.

That the 11 following Fellows had withdrawn :—

Stanley Arden.
Walter Henry Baker.
Miss Grace Bigby.
Dr. Cyril Crossland.
Stephen Troyte Dunn.
George Godfery Gray.
Sir Arthur Henry McMahon.
Hugh Scott, M.A.
Thomas Robertson Sim.
David George Stead.
Wilson Crosfield Worsdell.

And that the Council had removed the 10 following from the List, in accordance with the Bye-Laws, Chap. II. § 6 :—

Ernest John Bickford.
Bernard Francis Cavanagh.
Dr. Frank Cavers.
Banawari Lal Chaudhuri.
Maurice Holtze.
Christopher Mudd.
George Penrose.
Frederick William Edward Shrivell.
Dr. Ralph Vincent.
Herbert Fuller Wernham.

During the same period, 36 Fellows have been elected, of whom 33 have qualified for admission up to the present. Also 1 Foreign Member and 2 Associates have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 64 volumes and 753 pamphlets and parts, by exchange 40 volumes and 553 detached parts, by purchase 59 volumes and 203 parts; in all, the accessions amounted to 163 volumes and 1509 pamphlets and separate parts.

Books bound amounted to 505: 3 in morocco, 98 in half-morocco, 69 in buckram, 39 in half-buckram, 184 in cloth, with 112 re-backed.

The General Secretary having read the Bye-Laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to ballot.

The Ballot for the Council having been closed, the President appointed Mr. F. N. Williams, Mr. T. A. Sprague, and the Rev. Canon G. R. Bullock-Webster, Scrutineers; and these, having examined the Ballot-papers and cast up the votes, reported to the President, who declared the Council to be as follows :—

Edmund G. Baker, Esq.; Dr. William Bateson, F.R.S.; *Prof. Margaret Benson, D.Sc.; *E. T. Browne, M.A.; R. H. Burne, Esq.; Stanley Edwards, F.Z.S.; Prof. J. B. Farmer,

F.R.S.; E. S. Goodrich, F.R.S.; Dr. B. Daydon Jackson; C. C. Lacaita, Esq.; *Gerald W. E. Loder, M.A.; Horace W. Monckton, F.G.S.; R. I. Pocock, F.R.S.; Dr. A. B. Rendle, F.R.S.; Dr. D. H. Scott, F.R.S.; Miss A. Lorrain Smith; Arthur W. Sutton, Esq.; *Dr. Harold Wager, F.R.S.; Lt.-Col. J. H. Tull Walsh; *Dr. A. Smith Woodward, F.R.S.

(New members of Council are shown by an asterisk; the retiring Councillors being: Mrs. Arber, D.Sc., Miss G. Lister, Dr. G. E. Nicholls, and Sir David Prain, C.M.G., C.I.E., F.R.S., the fifth vacancy being due to the death of Sir Frank Crisp, Bt.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers; and these, having examined the Ballot-papers and cast up the votes, reported to the President, who declared the result as follows:—

*President*: Dr. Arthur Smith Woodward, F.R.S.

*Treasurer*: Horace W. Monckton, F.G.S.

*Secretaries*: Dr. B. Daydon Jackson.
E. S. Goodrich, F.R.S.
Dr. A. B. Rendle, F.R.S.

The President then delivered his Presidential Address, on "The Relationship of the existing Statutes of the Society to our present needs."

# Treasurer's Accounts for the Year ended April 30th, 1919.

(Presented at the Anniversary Meeting, May 24th, 1919.)

*Receipts and Payments of the Linnean Society from May 1st, 1918, to April 30th, 1919.*

*General Account.*

| *Receipts.* | £ | s. | d. |
|---|---|---|---|
| Balance at Bankers on 1st May, 1918 | 1165 | 8 | 8 |
| Cash in hand | 10 | 1 | 11 |
| Interest on Investments | 301 | 8 | 5 |
| Admission Fees | 204 | 0 | 0 |
| Annual Contributions | 1605 | 0 | 0 |
| Compositions | 233 | 0 | 0 |
| Sales of Publications :— | | | |
| Transactions £157 18 10 | | | |
| Journals 145 19 3 | | | |
| Proceedings and Catalogues 7 13 5 | | | |
| | 311 | 11 | 6 |
| Fellows' postal account, deposits | 12 | 14 | 4 |
| Miscellaneous Receipts | 30 | 4 | 6 |
| Proceeds of Sale of £1150 Metropolitan Consolidated 3½ % Stock | 955 | 14 | 3 |
| | £4829 | 3 | 7 |

| *Payments.* | £ | s. | d. |
|---|---|---|---|
| Taxes and Insurance | 26 | 16 | 7 |
| Repairs and Furniture | 61 | 9 | 5 |
| Coal, Electric Current, and Gas | 61 | 17 | 8 |
| Salaries | 809 | 9 | 3 |
| Library :— | | | |
| Books (New Books £19 12 1) £86 0 7 | | | |
| Binding 156 4 6 | | | |
| | 242 | 5 | 1 |
| Expenses of Publications :— | | | |
| Printing £394 15 1 | | | |
| Illustrations 61 4 0 | | | |
| Distribution 34 13 6 | | | |
| | 490 | 12 | 7 |
| Miscellaneous Printing and Stationery | 217 | 18 | 6 |
| Petty Expenses (including Tea and Postage) £110 1 7 | | | |
| Fellows' postal account 3 15 1 | | | |
| | 113 | 16 | 8 |
| Investments £189 0 9 5 % War Loan, 1924 47 £180 17 11 | | | |
| „ £2150 National War Bonds, 5 % (£1850 of these converted to £1947 7s. 4d. War Loan) 2150 0 0 | | | |
| | 2330 | 17 | 11 |
| Linnean Medal | 15 | 5 | 0 |
| Cost of Riseley Memorial Tablet | 12 | 0 | 0 |
| Balance at Bankers, 30th April, 1919 (including £91 12 10, deposits, Fellows' postal account) £444 13 7 | | | |
| Cash in hand 2 1 4 | | | |
| | 446 | 14 | 11 |
| | £4829 | 3 | 7 |

## *Separate Account.*

| | £ s. d. | | £ s. d. |
|---|---|---|---|
| To Balance at Bankers, 1st May, 1918:— | | By Binding of Books (Tagart Fund) | 1 5 9 |
| Westwood Fund £10 19 2 | | „ Hooker Lecture (Hooker Lecture Fund) | 16 17 0 |
| Trail Award Fund 12 6 0 | | | |
| Crisp Award Fund 7 17 0 | | „ Purchase of £50 National War Bonds, 5%:— | |
| Hooker Lecture Fund 18 2 10 | | Westwood Fund £15 0 0 | |
| Tagart Fund 8 17 11 | | Hooker Lecture Fund 20 0 0 | |
| 58 2 11 | | Tagart Fund 15 0 0 | |
| | | 50 0 0 | |
| „ Interest on Investments:— | | „ Balance at Bankers, 30th April, 1919:— | |
| Westwood Fund £8 9 11 | | Westwood Fund £4 9 1 | |
| Trail Award Fund 3 10 0 | | Trail Award Fund 15 16 0 | |
| Crisp Award Fund 6 6 4 | | Crisp Award Fund 14 3 4 | |
| Hooker Lecture Fund 21 3 6 | | Hooker Lecture Fund 2 9 4 | |
| Tagart Fund 24 14 2 | | Tagart Fund 17 6 4 | |
| 64 3 11 | | 54 4 1 | |
| £122 6 10 | | £122 6 10 | |

## *Investments on April 30th, 1919.*

### *General Account.*

| £ s. d. | | *Value, 30th April, 1919.* £ s. d. |
|---|---|---|
| 450 0 0 | Forth Bridge Railway 4 per cent. Stock @ 77 | 346 10 0 |
| 1000 0 0 | Metropolitan Consolidated 3 per cent. Stock @ 71½ | 715 0 0 |
| 1200 0 0 | India 3 per cent. Stock @ 60 | 720 0 0 |
| 1000 0 0 | Eastern Bengal Railway 4 per cent. Debenture Stock @ 76 | 760 0 0 |
| 1000 0 0 | Great Western Railway 4 per cent. Debenture Stock @ 89 | 890 0 0 |
| 300 0 0 | Midland Railway 2½ per cent. Perpetual Preference Stock @ 44½ | 133 10 0 |
| 2557 9 1 | 5 per cent. War Loan, 1929–47 Inscribed (including £421 1s. 0*d.* resulting from conversion of £400 National War Bonds in last year's Accounts) @ 93¾ | 2397 12 3 |
| 200 0 0 | 5 per cent. War Loan, 1929–47 Registered Certificates @ 93¾ | 187 10 0 |
| 300 0 0 | 5 per cent. National War Bonds, 1928 (part of £2150 purchased during the year, but not yet converted) @ 99¾ | 299 5 0 |
| | | £6449 7 3 |

## *Separate Account: Investments on April 30th, 1919.*

| | £ | s. | d. | | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| £870 9 5 | 232 | 5 | 0 | Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund) ..... | @ 62 | 143 | 19 | 11 |
| | 638 | 4 | 5 | Ditto ditto (Hooker Lecture Fund) ..... | @ 62 | 395 | 13 | 11 |
| | 100 | 0 | 0 | New South Wales 3½ per cent. Stock, 1930-50 (Trail Award Fund) ..... | @ 74 | 74 | 0 | 0 |
| | 252 | 18 | 0 | 2¾ per cent. Consolidated Stock (Crisp Award Fund) ..... | @ 55½ | 140 | 7 | 1 |
| | 530 | 0 | 0 | East India Railway 3½ per cent. Debenture Stock (Tagart Fund) ..... | @ 67½ | 357 | 15 | 0 |
| £50 0 0 | 15 | 0 | 0 | 5 per cent. National War Bonds, 1927 (Westwood Fund) ..... | @ 99¾ | 14 | 19 | 8 |
| | 15 | 0 | 0 | " " " " (Tagart Fund) ..... | @ 99¾ | 14 | 19 | 8 |
| | 20 | 0 | 0 | " " " " (Hooker Lecture Fund) ..... | @ 99¾ | 19 | 19 | 6 |
| £50 0 0 | 15 | 0 | 0 | 5 per cent. National War Bonds, 1928 (Westwood Fund) ..... | @ 99¾ | 14 | 19 | 3 |
| | 15 | 0 | 0 | " " " " (Tagart Fund) ..... | @ 99¾ | 14 | 19 | 3 |
| | 20 | 0 | 0 | " " " " (Hooker Lecture Fund) ..... | @ 99¾ | 19 | 19 | 0 |
| | | | | | | £1211 | 12 | 3 |

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1919, and found them correct. We have verified the Investments and Bank Balances.

Dated this 19th May, 1919.

W. B KEEN, *Chartered Accountant.*

STANLEY EDWARDS,
ROBERT PAULSON,
D. PRAIN,
ARTHUR W. SUTTON,
*Auditors.*

## PRESIDENTIAL ADDRESS, 1919.

The losses sustained by the Society during the past year have been many and severe. Among our Foreign members we lament Mr. Casimir de Candolle, the worthy bearer of an honoured name. Among our Associates we mourn the loss of Mr. Bagnall and Mr. Waterhouse, whose names have been upon our roll for over a generation. Among our senior Fellows we grieve over the death of Mr. Godman, only a year ago the recipient of the highest honour it is in the power of the Society to bestow. Other veterans whose loss we keenly feel include Mr. Worsley-Benison, Dr. Meiklejohn, Mr. Balston, Canon Norman, Lord Forrest of Bunbury, Mr. Roebuck, Sir Edward Fry, and Mr. Lace. Among our younger Fellows we have lost, along with others, colleagues so distinguished as Rev. Mr. Wright, Dr. E. A. N. Arber, Mr. Bancroft, Mr. Knipe, and Mr. Row. Our Council has suffered as severely as the general body of the Society. The session opened with the untimely death of Dr. Plimmer, one of our Vice-Presidents, whose charm of manner was only equalled by his knowledge and his sagacity. It closes under the shadow of the loss of Sir Frank Crisp, for nearly half a century one of our Fellows, during a moiety of his Fellowship our trusted Treasurer, and during the whole of it one of the wisest of our advisers and most generous of our friends.

For our continued welfare the Society is again indebted to the care of our Treasurer, our Secretaries, and our Council. To them your President for the time being is always greatly beholden. The occupant of the Chair this afternoon is unable to express as he would wish his sense of their unfailing support, which has lightened his task and relieved his anxiety during three sessions. The consideration shown him the while by the Society, has made pleasant the duty entrusted to him in an emergency. That emergency over, he has to thank you now for the additional favour of unconditional demobilisation and the satisfaction of placing his task in abler hands.

The business we transact at our Anniversary Meeting is usually confined to matters of domestic interest. This year it seems desirable, while our ballots are in progress, to consider the concerns of the Society, and take account of 'the Relationship of the existing Statutes of the Society to our present needs.' This subject is too wide to admit of exhaustive treatment during the minutes at our disposal. We have, however, recently added a new bye-law to our Statute-book. It seems, therefore, to be our duty to estimate the effect this new bye-law is likely to have on the Statutes and Orders of the Society.

A century after the grant of our Original Charter, we had to ask for a supplementary one. We sought power to do things we could not do under that of 1802, and to effect certain changes in the conduct of our business. The experience of a hundred years had shown that changes were desirable. We were given all we asked for. We availed ourselves of most of our new privileges at once. Our history since 1904 has justified that action.

The anxieties of the past four years have left our common good unscathed. The war preoccupations of the Fellows have not inhibited their work. The stringency of our economic conditions has not prevented us from publishing some of their results. But our anxieties have had another consequence. They have led us to give closer attention than usual to our management of the affairs of the Society.

When we asked for our Charter of 1902 one representation made was that it would be expedient and would conduce to the better and more convenient management of the concerns of the Society if we were enabled to limit by bye-laws the number of our Fellows and to determine the number of Fellows to be annually elected. Although we had been granted this privilege, we decided in 1904 that the time for its employment had not come. The attention we have had to give to our internal economy during the war has constrained us to make use of the power that has been in abeyance since 1902. We have this session limited by bye-law the number of our Fellows.

We now appreciate the foresight that led the Society to secure this privilege. We anticipate that the exercise of this power may yield satisfactory results. We know that the effects we hope for can only come gradually. They need not, on this account, be less certain or less beneficial. If the resolution of this session be maintained, it may prove as advantageous as the wise decision of sixty years ago to establish our 'Journal.' We can await the ultimate effects of our new bye-law with some confidence that their development will not disturb the even tenour of our progress.

We realise, however, that our decision is to have an immediate effect with which we must deal. This immediate effect is the creation of a waiting-list of those interested in the cultivation of the science of natural history who desire to become Fellows of the Society. The existence of a waiting-list obviously involves some modification in the conduct of our business.

A possible consequence of the existence of a waiting-list may be that we shall take a keener personal interest than heretofore in the responsible duty of choosing new Fellows. This should be one of the greatest benefits to accrue from our recent action. We may anticipate, however, that it will be one of the last benefits to manifest itself. Custom is powerful; neglect of this duty is widespread. By degrees our apathy may disappear.

An assured consequence of the existence of a waiting-list will be that those Fellows who have always attended to this duty must regard their old task from a new point of view. Hitherto they have had to assess the absolute qualifications for Fellowship of each individual candidate for election at any time. Henceforward they will have to adjudge the relative merits of all the candidates for election at a given time and to decide which of these candidates are likely, if elected, to render the Society most assistance. Again custom must prove powerful; the task of re-orientating ourselves may be hard and slow. In time, however, we should succeed in adjusting ourselves to our new duty. When we do succeed in this, we shall have the satisfaction of knowing that, at last, the business of bringing the Society into conformity with modern needs has really commenced. Once that business has begun, its fulfilment, though necessarily slow, should be automatic and therefore assured.

What now concern us, however, are certain difficulties that must be overcome before we can begin to carry out our altered duties. We are not in a position to help the Society to bring about the improvements our new bye-law is intended to effect until our Council shall devise certain new regulations and modify certain existing ones.

The first difficulty to be overcome relates to the 'Days of Election.' Hitherto we have balloted for the election of new Fellows at practically every ordinary meeting throughout a session. This arrangement was satisfactory and convenient when the only issue before Fellows present and voting was the eligibility for election of an individual candidate. In future the issue must include a comparative estimate of the merits of all the candidates whose claims have to be considered in the course of an entire session. Under the new conditions, therefore, our present practice of taking a piecemeal interest in the elections of a whole year must prove so inconvenient as to be intolerable.

Council may, we hope, determine on our behalf that, in future sessions, meetings for election be confined to some particular date or dates. When and how often, in a given session, elections should be held it will be for Council to advise. But we as Fellows may legitimately represent that the fewer the days for election in a given session, the greater will be the convenience to those Fellows who take part in the work. What is of more consequence than the general convenience of Fellows, is that the fewer the days of election in a particular session may be, the more effective must be the discharge of the duty now devolving upon us.

A more important difficulty is that connected with the 'Selection of Candidates.' The object of our Society is the cultivation of the science of natural history in all its branches. We are on a footing of absolute equality in so far as concerns our

interest in that object; our eagerness to acquire all the information that any one of our Fellows is willing to impart; our readiness to supply to all of our Fellows any information that we as individuals are privileged to possess. We are further on a footing of absolute equality in our appreciation of the truth that all of us have not enjoyed identical opportunities of acquiring knowledge; all of us are not endowed with the same power of conveying information.

It may be a drawback to us as individuals that our opportunities of acquiring knowledge have not always been the same. But this is no disadvantage to the Society as a whole, nor does it affect our mutual esteem. We do not look with disregard upon a Fellow who has mastered the methods needed in working out the life-history of some organism inimical to plant or animal life because he tells us that he has not mastered the methods required in fixing an immune plant or in preparing a protective serum. Nor do the masters of these diverse methods look with disregard upon the taxonomic workers whose philosophic study may have provided all three with criteria that aid them in fixing their respective bench-marks.

Whether the gift of exposition be always innate or sometimes acquired we need not now consider. What we know is that it exists in varying degrees. Our experience warns us that it may be equally variably manifested in future candidates for election.

Hitherto the name of every candidate for admission has come up for consideration in the order determined by the date on which the paper proposing him was presented to the Society. This arrangement was satisfactory when the number of Fellows was not limited. If the only considerations to be taken into account in future had been our prerogatives as individual Fellows this method might continue unmodified. It will, indeed, be desirable that, for the present, this method be followed still so far as concerns the greater number of the proposals that come before us when vacancies in our List have to be filled. But we have now to take into account the interests of the Society as a whole. This new consideration is at least as important as the privileges of proposers of candidates.

We shall all, as heretofore, take every opportunity that offers of proposing for election candidates able to help the Society by their work in those branches of natural history with which we, as individuals, are especially conversant. But we shall all in future desire that at every election we be given an opportunity of considering the claims of candidates likely to add materially to our knowledge of natural history in branches outside our own particular fields of study. We must therefore arrange that there be chosen from among the candidates for Fellowship on each election day as large and as constantly increasing a proportion as possible of new Fellows calculated to be as able as they are willing to impart the information they may possess.

We need the help of our Council if we are to accomplish what we wish. We must ask Council to scrutinise on our behalf, in advance of each election day, the waiting list of candidates in its entirety, and we must authorise Council to select from the whole list, without reference to the date of proposal of any candidate, and with regard only to the qualifications of all the candidates, the names, within some predetermined maximum number, of those whom they can recommend to us for immediate election.

A minor but not unimportant matter is that of 'Validity of Proposals.' When, in time, we come to appreciate as we should our new responsibility, a particular candidature may be unsuccessful at the first ballot. Such a candidature will therefore have to be reconsidered at the next succeeding ballot or ballots. A decision must therefore be arrived at beforehand as to the duration of the period within which a particular proposal shall continue to be valid. There may even be instances, in our subsequent history, when a particular candidature may prove unsuccessful at every ballot during the period of validity of its proposal. Such a proposal may be replaced by a new proposal. Again therefore there must be a decision in advance as to the time that should elapse before such a new proposal can be received by the Society.

So far we have been considering matters which call for the framing of new regulations. Doubtless our new Council will prepare and submit for our approval, as soon as they can conveniently do so, the regulations we need. The requisite approval we must accord without delay if we really desire to pay due regard to the spirit of the decision which renders them necessary.

Let us now turn to matters, equally urgent, which differ from the ones so far discussed in that our Statute-book already contains regulations that profess to deal with them. We must make quite certain that these old regulations, in their present form, meet our new needs.

One of these matters is the 'Admission of Fellows.' Our bye-law on this subject enjoins that every person chosen a Fellow shall appear personally for his admission within a space of six months from the date of his election or within such further time as shall be granted by the Council. The 'List of the Society' now shows how we have been treating what our predecessors considered a necessary order. Nearly one-third (30·6 per cent.) of the Fellows who have paid their admission fees have not appeared in person to sign their obligation and receive the right hand of fellowship. It is no empty formality they thus disregard; a Fellow may not vote at any election or meeting till he has been admitted.

Some may feel that the situation is less serious than it seems. Over one half of the Fellows who have not yet sought admission (16·3 per cent. of the Society) may have been prevented because they are usually resident outside the United Kingdom. The

suggestion is more specious than convincing: there are such events in the lives of most Fellows who reside abroad as visits to London. But we need not press this point; it is sufficiently disquieting to know that one seventh (13·6 per cent.) of our Fellows, though resident in the British Isles, take so little interest in our common good that they remain unqualified to share in our deliberations. Even among Fellows living in the London area we find a few (3 per cent. of the Society) who are not in a position to help in the management of our affairs.

The attitude of these unadmitted local Fellows is our safest guide to the significance of what is a disquieting habit. That attitude supplies the satisfactory assurance that abstention rarely reflects disrespect towards the Society. Fellows not yet admitted attend our ordinary meetings, take part in our discussions and at times read papers in this room. If this help to mitigate our concern, it at the same time increases our regret. The part such Fellows take in our scientific work often leads us to wish that they could assist us in managing our business. We cannot secure their aid because they insist on remaining unqualified to render it. Sometimes abstention is due to reserve; sometimes to forgetfulness of our bye-laws; at worst, to some want of consideration for the best interests of the Society. It should be our business therefore to encourage the diffident, to remind the oblivious, and to induce the unthinking to take some account of the common good of the corporation to which they belong.

But we must do more than this. The blame does not rest exclusively on our unadmitted Fellows. Nothing can be more hurtful to us than to place an order on our Statute-book and allow it to remain a dead-letter. This we are doing. We must take steps to enforce our order. We cannot excuse ourselves by saying that our order is explicit and that the practice of ignoring it is due to our Council having granted extensions of time that are unduly long. We were responsible in 1904 for the approval of the bye-law which contains that order. We deliberately omitted to confer on our Council authority to inflict any penalty if the order were disobeyed. By so doing, we compel Council, out of regard for our reputation, to grant extensions of time that can only end at the Greek Kalends. Our Council has, indeed, enabled us to appreciate, by means of the 'List of the Society,' what the effect of our action has been. During the past two years this intimation has remained unheeded. No Fellow has thought fit to allude to it or to make any representation on the subject.

It is possible that we refrain from stating the ultimate penalty for neglect to attend for admission because we make that penalty clear in a bye-law which enjoins that if any person refuse to subscribe the obligation we sign before we are admitted, the election of that person shall be void. If so, our decision not to state the penalty in both bye-laws was an unfortunate economy of words, not so much because it nullifies our intention, as because it exposes us to a vexatious imputation. We are fully entitled to

cancel the election of any Fellow who refuses to subscribe his obligation when he appears for admission. But we safeguard ourselves against the disagreeable necessity of inflicting that penalty by the dubious expedient of indicating that such a Fellow need not incur the penalty provided he be sufficiently discreet to refrain from presenting himself for admission. We have no desire to benefit by the annual contributions and admission fees of persons who conscientiously object to assist the Society in its work. What we do urgently need is a slight but necessary modification in the drafting of one of our bye-laws.

What concerns us now, however, is not so much the past neglect of our bye-law regarding 'Admission,' as the attention this bye-law must receive in future. We may rely, as hitherto, upon our Council to treat with consideration those applications for extension of time from new Fellows who, owing to residence abroad, to sickness, or to some other adequate cause, are unable to seek admission within six months. We may be assured that renewed applications on similar grounds will be considered with care and sympathy. But we must make it clear by bye-law that when in future an elected Fellow has failed to seek admission within six months and has taken no trouble to ask for an extension of time, his election shall be void. It is unthinkable that we should retain on our List the name of any Fellow who thus disregards one of our orders, to the exclusion from Fellowship of a candidate who is prepared, if elected, to subscribe his obligation to the Society and to promote its common good.

A point that calls for thought is the apparent difficulty of applying such a regulation in the case of a Fellow who desires, on his election, to compound for all future contributions by a single payment. The difficulty is less serious than it looks. Already we distinguish between Fellows usually resident outside the United Kingdom and Fellows usually resident in the British Isles. We did, at one time, recognise that the former, who cannot use our library and attend our ordinary meetings, are at a disadvantage as compared with the latter, who enjoy these two advantages. Our Statutes do not permit any non-resident Fellow to appear in person for admission until he shall have produced satisfactory security that his annual contributions be duly paid in advance, or shall have compounded for all future annual contributions by a single payment. Our Statutes, on the other hand, permit any resident Fellow to appear for admission as soon as he shall have paid his admission fee and his first annual contribution. The bye-law as regards non-resident Fellows would be admirable, if we took care to see it enforced. It should therefore remain, provided we decide to continue the concession as to composition. The difficulty as regards resident Fellows can be easily overcome by the insertion, in the bye-law relating to them, of the converse order that the privilege of composition may only be enjoyed by those who have duly appeared

in person to sign their obligation to the Society and have been duly admitted.

The consideration of this difficulty brings us naturally to the last matter we need consider to-day—'The Payments to be made by the Fellows.' Following the order of our bye-laws on this subject, we may begin with the Statute relative to the 'Admission Fee' which becomes due on election and must be paid before admission by every Fellow, unless by Special Order the Council have remitted that fee in whole or in part. The authority thus given to our Council we know by experience to be most conducive to the higher interests of the Society. We must therefore endeavour, at all costs, to leave this satisfactory bye-law relating to payments in its present form.

The regulations we have prescribed as regards the payment of 'Annual Contributions' are not so well adapted as we could wish to meet our present needs. Our actual order enjoins that, before admission, every Fellow shall pay his first annual contribution, and shall pay the like sum annually in advance on each succeeding 24th day of May so long as he shall continue a Fellow. We are to be congratulated on the possession of so explicit a bye-law. We are further to be congratulated on the fact that the habit of ignoring this bye-law is less prevalent than that of neglecting our order requiring elected Fellows to attend in person for admission. The explanation may be that we do in this case prescribe a penalty for non-compliance with the order. After a long and painful process we actually summon up sufficient courage to enforce that penalty. We cannot, however, congratulate ourselves with regard to that process. A Fellow must have failed on three succeeding Anniversary days to pay his annual contribution ere we permit our Council to post his default. Even then we insist that a further interval shall elapse before Council can order the removal of the name of the defaulter from the List of the Society.

This regulation is obviously ill-adapted to meet the case of the Fellow who has fallen into arrear through oversight. An inadvertent defaulter will ordinarily pay a forgotten annual contribution as readily, and more cheerfully, if his name be posted at once. We cannot expect him to thank us for permitting his arrears to run on till he owes the Society three contributions. Our want of consideration for the purely casual defaulter is, perhaps, the best proof that our procedure is dictated by consideration for cases of default due to some other cause. Now, there can only be two kinds of default other than the purely inadvertent: default by those who do not desire, and default by those who cannot manage, to meet their obligation. In neither case does our procedure bring benefit to the Society or assistance to a Fellow. In the one case it engenders irritation, in the other it creates embarrassment.

We tacitly admit that, so far as concerns those who are unwilling to pay, our procedure is disadvantageous to the Society.

We show this by reserving the right to put any Fellow we may remove in suit for the recovery of arrears. With this salve to our consciences we have to be satisfied. Our Council wisely protect us against ourselves by treating our threat as the *brutum fulmen* it really is. Our chief concern, however, is with cases of another character. Out of regard for the higher interests of the Society, we give authority to our Council to deal, after three defaults, with an 'Annual Contribution' exactly as we already have empowered them to deal, at once, with an 'Admission Fee.' We must, if we wish to benefit the Society, transfer this authority to an earlier bye-law, and so enable Council to exercise that power, in suitable cases, without delay.

For the moment, however, we are more concerned with new duties than old derelictions. Our existing procedure cannot be continued. We must temper our well-meant leniency in cases of default from whatever cause arising, with justice to our common good. We no longer possess the right to retain on the 'List of the Society' for a single session the name of any Fellow whose annual contribution has not been paid in advance, to the exclusion from Fellowship of a candidate prepared to pay not only an annual contribution but an additional admission fee.

At the same time, something has to be said on the other side. The penalty we do eventually impose, in cases of default to pay 'Annual Subscriptions' in advance, is removal. This penalty is, in certain cases, far too harsh and drastic.

When we look, in our 'Proceedings,' at the accounts of the business transacted at our Anniversary Meetings, we find that we impose the penalty of removal both upon non-resident and upon resident Fellows. The cases of these two classes of Fellows are not the same. The removal of a non-resident Fellow should be supererogatory. If a non-resident Fellow has complied with our order either to provide security for the payment of his annual contributions or to compound for these contributions by a single payment, it is obvious that he never can be in arrear. If the payments of a non-resident Fellow ever be in arrear it is obvious that he has not complied with one of our bye-laws. We have, moreover, ruled that until a non-resident Fellow shall have complied with this order he is not qualified to appear for admission.

We have ruled that if any Fellow refuse to sign his obligation to the Society when he appears for admission, the election of that Fellow is void. We have implied our intention to regard as void the election of any Fellow who fails to appear for admission within a prescribed period. We ought then, *a fortiori*, to regard as void the election of a non-resident Fellow who has failed to qualify to present himself in person for admission. The fact that a non-resident Fellow has fallen into arrear with his annual contributions, shows us that his election should have been made void before the necessity for his removal could arise.

The most serious aspect of any instance in our history of the removal of a non-resident Fellow on account of arrears is the gravity of its reflection upon ourselves. It proves that we have been as unmindful of our duty as regards the enforcement of an order of our own as to 'Payments to be made by Fellows,' as we have already found ourselves to be in respect of our bye-law as to 'Admission.'

If we be prepared in future to fulfil our own duty towards the Society it is clear that cases of arrears must be confined to resident Fellows. Hereafter, as hitherto, Fellows in arrear must fall into one or other of two categories. Either they will be Fellows who have explained in writing beforehand to one of the officers of the Society the circumstances that are to prevent them from paying their annual contribution on the next ensuing 24th day of May, or they will be Fellows who have failed to make such an intimation. We may deal with the latter category first.

In the case of any Fellow who has failed to pay his annual contribution in advance on Anniversary day and has sent no intimation on the subject beforehand, all that seems to be necessary is to send to that Fellow, before 31 May, a formal request to remedy the omission. Should the contribution thus due remain unpaid on 31 August the name of the Fellow in arrear must automatically disappear from the 'List of the Society' issued in November of the year in which default takes place. But if the Fellow whose name must thus be deleted has, prior to the date on which default takes place, been duly admitted to the Society, he ought to be regarded as suspended from Fellowship, not as removed from the Society.

The penalty involved will be sufficiently severe. A vacancy caused by the suspension of any duly elected Fellow will enable the election of a new candidate in his place at the next ensuing day of election. This, however, should not deprive any duly admitted Fellow whose name is thus suspended of the right to beg for reinstatement. Council should be given authority to deal with such an application. If there be proof (*a*) that the suspended Fellow was duly admitted before suspension, (*b*) that the arrears to which his suspension was due have been duly paid, (*c*) that he has, in addition, paid all the annual contributions due in respect of the whole period of his suspension, and (*d*) has provided satisfactory security—say an order on his bankers—for the payment of future annual contributions, Council might have power, if they should think fit, to reinstate the name of the applicant in the 'List of the Society' on the first occasion on which a permanent vacancy in the Society may take place. A duly admitted Fellow who has been suspended but who has applied for reinstatement and has paid in advance the annual contributions due from non-suspended Fellows should, notwithstanding his suspension, continue to receive the publications of the Society and be entitled to attend ordinary meetings. But so long as his suspension lasts he should not have liberty to vote at any meeting or election. On being

reinstated he should not be called upon to attend in person for readmission.

If a Fellow whose name has thus to be deleted from the List has not been duly admitted to the Society, his original election should be regarded as void. Should such a Fellow desire to rejoin the Society his name must be duly proposed for re-election and come up for consideration, unless the Council shall otherwise recommend, in the order determined by the date on which the paper proposing him for re-election is presented to the Society. During the interval between his removal and his re-election he should not enjoy any of the privileges of a Fellow. It will be for Council to decide whether his Admission fee be remitted or not.

The case of a Fellow who has explained in writing beforehand that he will be prevented from paying his annual contribution on the next ensuing 24th day of May will, as in the past, be taken into consideration by Council when his letter is laid before them. Such a case, if the Fellow has not appeared in person for admission, may involve removal; or, if the Fellow has been duly admitted, may involve suspension. At times, however, suspension of an admitted Fellow may be deemed inappropriate. Council already possess authority to deal with suitable cases by Special Order.

All of us do not pay annual contributions. The Society, in order to meet the convenience of the Fellows, gives everyone the option of 'compounding for all future annual contributions by a single payment.' This concession the Society is under no obligation to make. It is a grace or favour, not a right. In making the concession, all that the Society has to do is to ensure that the convenience thus offered shall not interfere with, or injure, the common good of the corporation. So far as resident Fellows are concerned, the privilege is accorded unconditionally. In the case of newly elected non-resident Fellows a condition appears to attach to the privilege. We seem to order such a Fellow to compound for his future contributions. This, however, is hardly the case. What we do is to order a newly elected non-resident Fellow to provide security satisfactory to the Council that his future contributions be paid. We only explain to such a Fellow that, if he be unable to provide the necessary security, 'composition' affords him a convenient way out of his difficulty.

The effects of this concession call for more careful consideration than they usually receive. Those who have taken advantage of the concession do not always appreciate how valuable it is. Those who have not compounded do not always realise how harmful to the Society any excessive use of the concession may prove. The concession is so familiar and so convenient that few of us can contemplate with equanimity the necessity for its cessation. The harm it does is, however, so manifest that it ought not to continue in its present form.

In theory a 'composition fee' should be as satisfactory as a series of annual contributions, since such a fee should add to the

capital of the Society a sum the interest on which will ultimately compensate for the loss to the revenue of the Society of the corresponding annual contributions. In practice, we know, that throughout our history some part of what, having been received in composition-fees, might have been added to our capital account, has had to be used as if it were revenue. Had this not been done, it would have been impossible to meet the cost of the Society's publications. We know, too, that the mischief is progressive. For some time we have been impelled to suspend the issue of our 'Transactions.' That this, to some extent, is to be explained by the unfortunate tendency to make excessive use of the privilege of compounding, which is so marked a characteristic at the present time, is at least probable. Compounders must necessarily be a source of keen anxiety to a careful Treasurer of any Society such as ours. Whether we like it or not, we must face the situation, and endeavour to find some equitable solution of our difficulty.

When the concession was first granted, Fellows who availed themselves of the convenience were asked to pay a uniform composition-fee, supposed on actuarial grounds to be sufficient to safeguard the financial interests of the Society. That it would be adequate for the purpose, if every Fellow were to compound for all future payments, we can easily believe. But every Fellow does not compound. If, therefore, by any chance, composition becomes characteristic of a particular class of Fellow, the balance between capital and revenue is liable to be upset.

So long as the original system, under which a uniform fee was enacted, remained in operation, any Fellow under the age of 35 who might decide to compound, could do so by paying a fee from £4 to £9 lower than the amount which the compounder's 'expectation of life' entitled the Society to demand. The group of Fellows under 35, moreover, included a fair proportion of the newly elected non-resident Fellows upon whom our Statutes bring indirect pressure to become compounders rather than contributors. The tendency under the old system therefore was for an undue proportion of our younger Fellows to compound.

A few years ago the Society gave careful consideration to this question and, as a result, our composition bye-law was so altered that the payment in lieu of all future contributions ceased to be uniform. This payment is now made in accordance with an actuarial scale that takes account both of the 'expectation of life' and the 'standing in the Society' of any individual Fellow who may compound. This new method effectually counteracts the tendency so disadvantageous to the Society which the old method that prescribed a uniform fee was known to have induced; the new system takes account, up to the age of 40, of the individual not of the collective 'expectation of life' of our Fellows. But, so far as the financial interests of the Society are concerned, the new system seems as defective as the old. After the age of 40 it takes account of the 'standing in the Society' of any Fellow who may

compound. As a consequence when a Fellow of upwards of twenty years' standing in the Society compounds now, he is permitted to do so on payment of a fee £4 to £6 lower than the amount which his 'expectation of life' should entitle the Society to exact. Thus the tendency under the present system is for an undue proportion of our older Fellows to compound. An examination of our accounts produces the unpleasant impression that this new tendency is even more disadvantageous to the financial condition of the Society than the one it has replaced.

It is not unusual to find that a modification of our Statutes leads to consequences uncontemplated when the change was resolved upon. The recent addition of a bye-law limiting the number of Fellows illustrates this. In that case, fortunately, the consequences of the change all promise to be beneficial. This cannot be said of the bye-law in which our composition-fee was altered from a fixed to a variable sum.

That particular change was intended, among other things, to afford some relief as regards payments to a particular group of our Fellows. This was perfectly legitimate. Unfortunately what is lawful need not be expedient. The Society offers the option of compounding to every Fellow. Only some of us can avail ourselves of the offer. The Fellow who compounds reaps the benefit of the sliding-scale. But the Fellow who can compound is the one who least needs this benefit. The sliding-scale does not affect the annual contributions of the Fellow who cannot afford to compound. This is unavoidable; justice to one part of a community need not advantage another part. But the fact that the annual contributor is no better off because the compounder receives assistance shows that our well-meant effort only partially fulfils its purpose.

The resident Fellows are mainly responsible for alterations in our Statutes; space and time prevent non-resident ones from co-operating. This is usually of small moment; the Statutes generally affect all Fellows alike. But the composition bye-laws are exceptional, for in one of these we order new non-resident Fellows, under special circumstances, to compound rather than contribute. We see that our present bye-law augments the fee payable by these newly elected non-resident Fellows, in some cases by the equivalent of three 'annual contributions,' notwithstanding the fact that non-resident Fellows could take no part in passing or in objecting to the bye-law. The Fellows affected have no ground for complaint; they are, after all, only asked to pay for the convenience we afford them what in their particular cases that convenience is worth. Again, however, a change intended by us to benefit all compounders is open to some objection. It adds to the financial obligation of the only kind of compounder in whose case compounding is not optional.

This is not the only respect in which non-resident and resident Fellows are differently situated. The former cannot as a rule consult our books and attend our meetings; the latter may do

both. This difference between the two classes is an accidental, not an essential feature of Fellowship. When we fixed a uniform composition-fee for all Fellows we excluded this 'accident' from consideration. But, while we did this, we nevertheless regarded the use of our library and of the meeting-room as advantages. Had we considered accidental circumstances at all our obvious duty would have been to have asked a rather smaller composition-fee from the non-resident Fellow who may be compelled to compound, than from the resident Fellow who need not compound unless he chooses.

In fixing our present sliding-scale we resolved to take into account the 'standing in the Society' of any Fellow who might compound. This circumstance is as purely accidental as that of residence within or outside the United Kingdom. What is more, when taking into consideration the 'standing in the Society' of a compounder, we are at pains now to regard the opportunity of consulting our library and attending our meetings as a disadvantage. We compensate a compounder of 20 years' standing and upwards for having endured that disadvantage so long; we make a new non-resident Fellow pay a larger fee than formerly when he compounds, because he does not ordinarily incur this disadvantage. This we feel can hardly be what we intended; it is, however, in effect what we do.

Our position as regards 'Composition' clearly calls for improvement. Doubtless the best course, financially, would be to cancel our concession. But, if for no other reason than that many of our Fellows are non-resident, this is far from desirable. It seems possible to continue the concession and, while so doing, both to retain our happy idea of making allowance for the 'standing in the Society' of a compounder and to add the further improvement of making allowance for the indirect compulsion we apply to new non-resident Fellows. Let us assume that the old fee of £45 corresponds fairly accurately with the collective as opposed to the individual 'expectation of life' of the Fellows. We might then permit any non-resident Fellow who compounds on being elected to do this on payment of £45 in addition to his 'admission fee.' Save as regards non-resident Fellows who compound when first elected, the fee for composition might be:—For Fellows of less than 10 years' standing, £50; of 10–20 years' standing, £45; of 20–30 years' standing, £40; of 30 years' standing or over, £35. This scale ought to safeguard our financial interests, provided all composition-fees received be invested. The scale suggested is, it will be appreciated, only offered by way of illustration. The actual scale it will be for Council to decide.

Our various well-meant but not always effective attempts to afford relief in respect of the payments to be made by the Fellows of the Society, teach us that the only safe course to adopt is to try to afford relief all round. Before we consider what form this 'all

round relief' should take it is necessary to make proper provision for this relief.

Every time an Admission fee is remitted there is a deduction from our Capital Account. Every time a Fellow in arrears has to be removed there is a loss to our Revenue Account. Every time a composition-fee on our present scale is paid there is a loss to both accounts.

This was serious, but could be defended, while our income was in theory capable of expansion, even though we were aware that in practice our income had become stationary. It was largely owing to the fact that our income had ceased to expand that we felt justified in limiting the number of our Fellows. Now that our income is definitely fixed, the three leakages mentioned must be stopped, not so much because they affect our material interests as because they damage those higher interests our recent action is designed to promote.

Against our income have to be set certain fixed charges which we can neither evade nor reduce. The balance left we devote to the publication of our results—a duty as instant as that of securing them. To reduce that balance means a dereliction of that duty. When granting relief in the matter of fees we must therefore clearly draw upon some fund independent of our normal income. We possess no such fund. Our immediate task therefore is to create one.

The happy thought which inspired our predecessors to grant authority to our Council to issue a Special Order in the case of an Admission fee or an Annual Contribution, supplies us with a convenient starting point. We can begin what may in time prove a boon to every new Fellow of the Society if we found now an unambitious 'Admission Fee Reduction Fund.' Out of the income of this fund we may give our Council authority to transfer to the account of the Society itself the equivalent of any Admission fee they may by Special Order remit. Out of the income of this fund, too, we can authorise Council, when we have amended their authority to deal with suitable cases of the kind, to transfer to the account of the Society the equivalent of any Annual Contribution they may by Special Order excuse. Out of the income of this special fund we may also hope from the first to pay to the Society on behalf of every new Fellow £1 of the £6 of his Admission fee.

The last of these desirable objects may be accomplished when the fund we require has reached a total of £1000. But we do not need, nor would we wish, to stop at this point. Year by year surplus revenue should be added to capital. Year by year we may hope for further individual contributions to the fund. When the revenue admits of this, the payment on behalf of each new Fellow towards the reduction of his Admission fee may be increased to £1 10*s*. Later, as the fund grows, £2 may be paid, and we may go on by increments of 10*s*. until the fund can

from its revenue ultimately pay to the Society on behalf of every new Fellow the entire Admission fee of £6. It seems possible that this result might be achieved with a fund of £4000, and the junior Fellows here to-day may hope to see such a fund created. Nor need the scheme end here. Our successors may in time be in a position to consider the payment on behalf of Fellows of some part of their annual contributions. None of us present can hope to see that day, for it will not be safe to begin the reduction of annual subscriptions till the fund invested amounts to at least five times £4000.

In the meantime, however, we need not build castles in Spain. We must now be content with the day of small things and may be satisfied if we can get our scheme, which seems to meet with approval on the part of Council, well and fairly launched by the accumulation of a Fund of £1000.

One eminent Fellow of the Society who favours this scheme has made the suggestion that our new Fund receive a distinctive name. He proposes that we dedicate it to the memory of the able naturalist who was our first Treasurer. We can hardly conceive a name of happier augury, since our Fund, if this suggestion be adopted, will be known as the 'Goodenough Fund.'

The thing that matters now is to create that Fund. It is the first step that counts; let us all help to take it.

Lord Rothschild, F.Z.S., then moved:—"That the President be thanked for his excellent address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which resolution, having being seconded by Dr. J. R. Leeson, was put and carried with acclamation.

Sir David Prain having acknowleged the vote of thanks, proceeded to address Professor Isaac Bayley Balfour, F.R.S., reciting his services to the study of Botany, and handing to him the Linnean Medal in gold. He said:—

Professor Isaac Bayley Balfour,—

No duty entrusted to me by my fellows during the past three years has afforded, or could afford me, greater pleasure than that which they have deputed me to perform on their behalf this afternoon.

It is now five and forty years since our illustrious master, Sir Joseph Hooker, first favoured the Fellows assembled in this room with information relative to the Island of Rodriguez that you had sent to him.

A year later you honoured this Society by joining our ranks, and in the course of the next two sessions papers on the vegetation of that island, communicated by you, were published in our

Journal, A fuller account of its botany was contributed by you to the 'Philosophical Transactions.'

Nor were these the only fruits of your Mascarene studies. We owe to you a finished account of the natural history of the genus *Halophila* and a valuable enumeration of the species of *Pandanus*.

Nearly forty years ago you undertook the botanical survey of the Island of Socotra, the results of which, after eight years of unremitting labour, were placed at our disposal in what must remain a classic among regional floristic studies. Mindful of the first business of the scientific traveller you secured data necessary for the determination of the source of such historic drugs as Socotrine Aloes and Dragon's blood.

This, however, forms but a small part of the title you have established to our admiration and our esteem. As a teacher of four decades of the *Scientia amabilis* you have exercised a powerful influence, in three several ancient and illustrious seats of learning, on those who have advanced and are advancing natural knowledge in the botanical field, and on the development of modern methods of botanical training. Nor has that influence been confined to these three schools. It has been exerted elsewhere by your labour in providing us with vernacular versions of erudite outland treatises and by the part you have played for now nearly a quarter of a century as one of the founders and editors of the 'Annals' of that Science it is our honour to serve. As the Keeper, during three decades, of a noble *hortus vivus* you have throughout that period kept in the memory of a generation apt to forget, how effective an instrument for the increase of natural knowledge such an institution with its concomitant collections may be. You have, moreover, at all times appreciated that fundamental obligation which rests on those so circumstanced, to improve for use the results of the investigations and researches there carried out. How truly and how fully these duties have been fulfilled is best realised by those who have followed your work in connection with the botanical exploration of South-western China and the North-eastern Himalaya, and have studied your contributions to the natural and cultural history of such protean genera as *Primula* and *Rhododendron*.

Your trained advice has at all times been freely at the disposal of botany, horticulture, and the mystery of healing, as your tried judgment has been appreciated by the science, the craft, and the art concerned.

It was hoped, three years ago, that our Society might enjoy the inestimable benefit of profiting by that advice and judgment as the occupant of this Chair, and the regret that this could not be has been felt more keenly by myself than it could be by any other Fellow. My recompense has come in the privilege now accorded to me of asking you on behalf of us all to accept this medal, the highest honour that we can offer you, and to receive with it our warm wish that you may long be spared to continue the work that has served us as an example and an encouragement.

The recipient made an acknowledgment in reply as follows:—

Mr. President,—

The moment and the very kind words which you have spoken about me naturally commit me to retrospection with thoughts—had this been done otherwise, had that been left undone, might not more and better things have been done?—with thoughts also of those kind friends—many they are—to whose advice, encouragement, and co-operation I owe so much for anything that has been done. And the picture I see is one of lights and shadows evoking not unmixed feelings. You, however, have decreed that I am not to be the grave of my own deservings, and I accept the honour you confer upon me to-day—in the terms of the award the highest mark of esteem in the power of the Society to bestow—with satisfaction born of the greatest gratification. It comes to me, Sir, with all the real value of spontaneous tribute from my compeers, telling me that in some ways at least during the now many years in which I have shared in holding aloft the torch of botanical science I have not been unworthy. The acclaim of one's fellow-workers in "well-done" is assuredly the greatest of all honours—a prize to be cherished. That you have given me to-day and I thank you.

The General Secretary having laid upon the table the Obituary Notices of certain deceased Fellows, the proceedings terminated.

## OBITUARY NOTICES.

Edward Alexander Newell Arber, M.A., Sc.D.—By the premature death of Newell Arber on June 14th, 1918, the Society has lost one of its ablest Fellows, and Botany, especially Palæobotany, one of its most energetic and devoted workers.

Newell Arber was born in London on August 5th, 1879. His father, Edward Arber, became Professor of English at Mason's College, Birmingham, and was well known as the editor of many English Classics.

Newell Arber's health compelled him to make a long stay at Davos, at the age of 15. It was then that he first came to know the Alpine Flora, to which he was passionately devoted throughout his life. Prof. Oliver, F.R.S., writes of their first meeting in the early nineties: "We soon discovered a common enthusiasm for the Alps, which in Arber's case was all-consuming. So far as he was concerned there was an alpine botany and other botany—the latter he regarded through the glamour of the former."

Arber's early education was obtained at King Edward's School, Birmingham, where his form-master, Mr. Turner, inspired him with a love for botany. He subsequently worked at Mason's College and University College, London, and in 1893–4 spent a year gardening in the Royal Horticultural Society's Gardens, then at Chiswick—a valuable experience, which added to his many-sided interest in plant-life.

When Arber went up to Trinity College, Cambridge, in 1895, his object as he said, was to qualify himself to pursue original work in botany, and to follow that subject as a profession. While he never lost sight of this main purpose, he soon became equally keen on geology, and took both subjects for the Second Part of the Tripos. The union of the two sciences naturally suggested fossil botany as an appropriate field, and he at once began this study, on the advice of his good friend and teacher Prof. McKenny Hughes, who appointed him Demonstrator in Palæobotany as soon as he had taken his degree. He continued to hold this post to the end of his life; during his tenure of office about 5000 specimens were added to the fossil plant collections of the Sedgwick Museum, while he enlisted many able recruits for the subject from among his students.

Arber's scientific work may for the most part be grouped under three heads: recent botany, morphological and evolutionary palæobotany, and stratigraphical palæobotany. We may now briefly refer to some of his chief publications in each branch.

His earliest papers were on recent botany; the first was a theoretical discussion of the relationships of the indefinite inflorescences (1, 1899). In the same year he wrote on the British and Swiss alpine Floras, a congenial subject, on which he was already qualified to speak (2, 1899). His next two papers were on a physiological question—the effect of nitrates and other salts on the assimilation of certain Green Algæ; this investigation, suggested by his teacher Francis Darwin, was without relation to his subsequent work, but it is a gain to any morphologist to have once dipped into physiology (3 & 4, 1901).

After a short interval, Arber returned to recent botany in a paper on true and false synanthy in the genus *Lonicera* (10, 1903). His chief contribution, however, to the study of living plants was his volume on 'Plant Life in Alpine Switzerland' (43, 1910), probably the work which gave him the most pleasure; he knew the alpine Flora with the intimacy derived from more than 25 visits to the Alps. The fine photographs illustrating the volume were mostly his own work. The book is adapted to the general reader; any detailed criticism must be left to those whose knowledge of the Flora is comparable to that of the author.

Turning now to the main work of Arber's life, fossil botany, we will first glance at some of his chief memoirs of structural and morphological interest. Arber was the first to figure and to describe in modern language, Binney's type-specimens of *Lyginodendron oldhamium* (7, 1902). In the Binney collection he also

found a good specimen of *Medullosa anglica*, which enabled him to add to our knowledge of the roots, and to describe the structure of the sieve-tubes, a point rarely observable in petrified plants (13, 1903). In 1904 Arber named and described a silicified tree-trunk from Tasmania, of Tertiary age, recorded by Sir Joseph Hooker more than 60 years before (17, 1904). A paper on new species of *Lagenostoma* is of special interest from the fact that in one of them the cupulate seeds were still attached to the rhachis of the frond (20, 1905).

Arber's British Museum Catalogue of the *Glossopteris* Flora, an important systematic work, contains an account of the probable sporangia associated with the scale-fronds of *Glossopteris*, which he had described more fully in a separate paper (22 & 23, 1905). This was the first time that any light had been thrown on the reproduction of this important fossil genus.

In a valuable theoretical essay on the past history of the Ferns, Arber proposed the class-name Primofilices for the Palæozoic stock from which the Mesozoic Leptosporangiatæ were derived, the Botryopterideæ (in the wide sense) being the best known family within the group. The name Primofilices has often been misunderstood; it was not intended to imply the primitiveness of the group, but rather its antiquity, as being characteristic of the Primary Rocks. Rightly interpreted the designation serves a useful purpose. In this memoir Arber expressed a judicious scepticism as to the supposed dominance of the Eusporangiate Ferns in the Palæozoic; he further pointed out that the resemblance between the sporangia of such Ferns and the pollen-sacs of the lower Spermophyta, may well be a case of homoeomorphy rather than a mark of affinity, a suggestion which now appears worthy of serious consideration (24, 1906).

In the well-known memoir by Arber and John Parkin on the Origin of Angiosperms (29, 1907) the idea of a relation between Angiosperms and Bennettiteæ, already suggested by Wieland, is worked out in detail and elaborated into a definite phylogenetic theory. "It appears to us," they say, "that although the direct ancestors of the Angiosperms are as yet unknown in the fossil state, this line of descent can now be traced back to the great group of Mesozoic Cycadophyta, and to a hypothetical race of plants nearly related to the Bennettiteæ" (p. 30). Wieland himself expressed a very favourable opinion of the paper. Shortly afterwards he discovered in his *Williamsonia mexicana* a type of stamen which almost exactly realises that postulated by Arber and Parkin in their reconstruction of the hypothetical Hemi-angiosperm.

The present writer, who has maintained essentially the same hypothesis of the origin of Angiosperms, was first put on the track in a conversation with Arber. Mrs. Arber tells us that Professor von Wettstein of Vienna "proposed and arranged the translation of the Origin of Angiosperms into German." "He wrote concerning this paper: 'As I have been occupied for some

years with the same question I know how to appraise its great worth, although I represent totally different views.' The trouble taken by the Austrian professor to give publicity to a theory which ran altogether counter to his opinions, deserves to be placed on record as a remarkable instance of scientific broad-mindedness." *

In the following year Arber and Parkin extended their theory to the Gnetales and adduced evidence to show that this enigmatic group sprang from a common stock with the Angiosperms and developed, in many respects, along parallel lines (34, 1908).

A conjoint memoir with Hamshaw Thomas, on the structure of *Sigillaria scutellata*, etc., was the first full account of the anatomy of a ribbed Sigillarian stem. Among other points of interest, the authors showed that the leaf-traces are double, a fact which enabled them to identify the isolated leaf *Sigillariopsis sulcata* as that of a ribbed *Sigillaria*. A subsequent note demonstrated the same feature in *S. mamillaris* (33, 1908; 39, 1909).

In 1911 Arber took a leading part in the opposition to compulsory Latin diagnoses of fossil plants, as required by the Brussels Botanical Congress of 1910, and met with strong support †.

A note on a new *Dadoxylon* from the Halesowen Sandstone is of interest, for the characters of the pith showed that the plant was not a *Cordaites*: the author regarded it as a Conifer (60, 1913).

In 1913 Arber contributed to a German encyclopædia an article on intermediate stages between Ferns and Seed-Plants, probably his only work appearing in German, and remarkable, in these days, as an example of international science.

Arber's 'Revision of the Seed-Impressions of the British Coal-Measures' is a laudable attempt to deal with a difficult problem, on which probably no two palæobotanists will agree. He recognized 14 genera, of which 9 were new. All the 37 British species are figured, and the memoir is a record of permanent value (62, 1914).

A short note on sub-medullary casts of Calamites, in which the features of the casts are explained by comparison with sections of structural specimens, was Arber's last published work (71, 1918).

We may now refer briefly to Arber's work in stratigraphical and taxonomic Palæobotany, which was very extensive and touched on the fossil Floras of many parts of the world—India, Australia, New Zealand, and South Africa, as well as nearer home. His earliest fossil work was on Royle's Types from India, and on the Clarke Collection from New South Wales (5, 1901; 6, 1902). His first paper dealing with a British Fossil Flora was on the Cumberland coal-field (9, 1903). An essay on the use of Carboniferous plants as zonal indices gave rise to a valuable discussion, to which the French authorities Zeiller and Grand' Eury contributed (14, 1903). A long series of subsequent memoirs dealt with the plants of the Ardwick series of Manchester (16, 1903);

* A. Arber, Journal of Botany, vol. lvi. November 1918, p. 308.
† See 'Nature,' vol. lxxxvi. May 18, 1911, p. 380.

the Culm Measures of North Devon, which he investigated with the utmost zeal, and showed to be mainly of Upper Carboniferous age (18, 1904); the Kent Coal-Field, on which he became an expert authority (36, 1909; 63, 1914; 67, 1916); the Yorkshire Coal-Field (46, 1910); the Lower Carboniferous Flora of Co. Antrim (50, 1912); the Coal-Measures of the Forest of Dean (53, 1912) and the Forest of Wyre (61, 1914); the Devonian Flora of North Devon (65, 1915) and the Coal-Measures of South Staffordshire (68, 1916). All these works, and others not enumerated here, are of both taxonomic and stratigraphical importance, and all are solid contributions to Fossil Botany on its geological side. In the course of these studies he developed a considerable consulting practice as an expert.

Arber's most valuable memoirs on the fossil plants of distant lands are his volume on the *Glossopteris* Flora, already mentioned, and his Mesozoic Floras of New Zealand. An important monograph on the latter subject was one of his latest publications (70, 1917). The age of the Floras described ranges from Triasso-Rhætic to Neocomian; in the later deposits Angiosperms are already represented. Arber also did much work on the Antarctic fossil plants of the Scott Expedition, though he never published on the subject.

As purely taxonomic works we may mention the papers on the Cycadophytic genera *Zamites* and *Pterophyllum* (30, 1907) and on *Psygmophyllum* (54, 1912). A useful elementary treatise on the Natural History of Coal, one of the Cambridge Manuals (48, 1911), was translated into Russian in 1914.

Arber contributed a little volume on Fossil Plants to Gowans's sixpenny Nature Books. It consists of 60 admirable photographs, nearly all by himself, with a few pages of explanation, and represents one of the rare attempts to interest the general reader in fossil botany (37, 1909).

Arber's fine book on the Coast Scenery of North Devon, bountifully illustrated by his own beautiful photographs, deserves mention, though scarcely at all botanical. It is a unique work, embodying much original research, and a charming guide-book for the geological tourist (47, 1911).

From the rapid sketch we have given of Arber's chief life-work, it will be seen that his activities were very varied. He was an enthusiastic field naturalist, in Geology as well as in Botany, while at the same time he had an intimate knowledge of the great European collections, and of the literature of his subjects. The amount of work which he accomplished in a life unhappily cut short in middle age, was extraordinary. His industry, however, was not of the plodding order, but was fired by a burning interest in Nature. The writer of these lines owes much to the constant discussion of many problems with his old friend, by letter or word of mouth.

Arber died at the height of his activity, and left behind a number of important unpublished MSS. One of these works, on the external morphology of Calamites, in conjunction with his pupil

Mr. Lawfield, is in course of publication by our own Society. It is hoped that others, especially a valuable and original memoir on the Devonian Floras, now the focus of palæobotanical interest, may eventually see the light.

Arber married, on August 5th, 1909, Miss Agnes Robertson, D.Sc., F.L.S., well known by her own botanical researches. To Mrs. Arber the present writer is much indebted for information and help. The bibliography appended to this notice was drawn up by her*.

Arber was elected a Fellow of our Society on June 4th, 1903, and served on the Council from 1908 to 1911. He was also a Fellow of the Geological Society, and a Doctor of Science of his own University. He was made an Hon. Member of the New Zealand Institute in 1914. [D. H. S.]

*List of Memoirs and Books by* E. A. Newell Arber *published between* 1899 *and* 1918.

(A number of Preliminary Notes omitted.)

1. Relationships of the Indefinite Inflorescences. Journ. Bot. vol. xxxvii. 1899, pp. 160–167.
2. The British and Swiss Alpine Floras. Journ. Roy. Hort. Soc. vol. xxiii. 1899, pp. 46–61.
3. On the Effect of Salts on the Assimilation of Carbon Dioxide in *Ulva latissima*, L. Ann. Bot. vol. xv. 1901, pp. 39–69.
4. On the Effect of Nitrates on the Carbon-Assimilation of Marine Algæ. Ann. Bot. vol. xv. 1901, pp. 669–681.
5. Notes on Royle's Types of Fossil Plants from India. Geol. Mag. dec. 4, vol. viii. 1901, pp. 546–549.
6. On the Clarke Collection of Fossil Plants from New South Wales. Quart. Journ. Geol. Soc. vol. lviii. 1902, pp. 1–26, 1 pl., 1 text-fig.
7. Notes on the Binney Collection of Coal-Measure Plants.—Part III. The Type-Specimens of *Lyginodendron oldhamium* (Binney). Proc. Camb. Phil. Soc. vol. xi. 1902, pp. 281–285, 2 text-figs.
8. On the Distribution of the *Glossopteris* Flora. Geol. Mag. dec. 4, vol. ix. 1902, pp. 346–349.
9. The Fossil Flora of the Cumberland Coal-field, and the Palæobotanical Evidence with regard to the Age of the Beds. Quart. Journ. Geol. Soc. vol. lix. 1903, pp. 1–22, 2 pls.
10. On the Synanthy in the Genus *Lonicera*. Journ. Linn. Soc., Bot. vol. xxxv. 1903, pp. 463–474, 3 text-figs.
11. (Conjointly with A. C. Seward.) Les Nipadites des Couches Éocènes de la Belgique. Mém. du Musée royal d'hist. nat. de Belgique, T. ii. Année 1903, 16 pp., 3 pls.
12. Notes on some Fossil Plants collected by Mr. Molyneux in Rhodesia. Quart. Journ. Geol. Soc. vol. lix. 1903, pp. 288–290.
13. On the Roots of *Medullosa anglica*. Ann. Bot. vol. xvii. 1903, pp. 425–433, 1 pl.

* Mrs. Arber has herself published two notices of her husband's life, in the Geological Magazine, decade 6, vol. v. pp. 426–31, September 1918, and the Journal of Botany, vol. lvi. pp. 305–8, November 1918, each with a portrait.

14. The Use of Carboniferous Plants as Zonal Indices. Transactions of the Institution of Mining Engineers, vol. xxv. 1903, pp. 371–386.
15. On Homoeomorphy among Fossil Plants. Geol. Mag. dec. 4, vol. x. 1903, pp. 385–388.
16. Notes on Fossil Plants from the Ardwick Series of Manchester. Mem. and Proc. of the Manchester Lit. and Phil. Soc. vol. xlviii. 1903, no. 2, 32 pp., 1 text-fig., 1 pl.
17. *Cupressinoxylon Hookeri*, sp. nov., a large Silicified Tree from Tasmania. Geol. Mag. dec. 5, vol. i. 1904, pp. 7–11, 1 pl., 2 text-figs.
18. The Fossil Flora of the Culm-Measures of North-west Devon, and the Palæobotanical Evidence with Regard to the Age of the Beds. Phil. Trans. Roy. Soc. London, ser. B, vol. cxcvii. 1914, pp. 291–325, 2 pls.
19. (Conjointly with I. Rogers.) Note on a New Fossiliferous Limestone in the Upper Culm-Measures of West Devon. Geol. Mag. dec. 5, vol. i. 1904, pp. 305–308.
20. On some New Species of *Lagenostoma*, a Type of Pteridospermous Seed from the Coal-Measures. Proc. Roy. Soc. B, vol. lxxvi. 1905, pp. 245–259, 2 pls. (*See also* Ann. Bot. vol. xix. 1905, pp. 326–328.)
21. The seed-bearing habit in the Lyginodendreæ. Proc. Camb. Phil. Soc. vol. xiii. 1905, pp. 158–159.
22. On the Sporangium-like Organs of *Glossopteris Browniana*, Brongn. Quart. Journ. Geol. Soc. vol. lxi. 1905, pp. 324–338, 2 pls.
23. Catalogue of the Fossil Plants of the *Glossopteris* Flora in the Dep. of Geology, British Museum (Nat. Hist.). Being a Monograph of the Permo-Carboniferous Flora of India and the Southern Hemisphere. lxxiv + 255 pp., 1 map, 51 text-figs., 8 pls. London, 1905.
24. On the Past History of the Ferns. Ann. Bot. vol. xx. 1906, pp. 215–232, 1 text-fig.
25. Bibliography of Literature on Palæozoic Fossil Plants, including some of the more important memoirs published between 1870–1905. Progressus Rei Botanicæ, Bd. i. 1906, pp. 218–242.
26. The Origin of Gymnosperms. Science Progress, vol. i. no 2, 1906, pp. 222–237.
27. On the Upper Carboniferous Rocks of West Devon and North Cornwall. Quart. Journ. Geol. Soc. vol. lxiii. 1907, pp. 1–27, 3 text-figs.
28. A note on fossil plants from the Carboniferous Limestone of Chepstow. Geol. Mag. dec. 5, vol. iv. 1907, pp. 4–5.
29. (Conjointly with John Parkin.) On the Origin of Angiosperms. Journ. Linn. Soc., Bot. vol. xxxviii. 1907, pp. 29–80, 4 text-figs. (Translated into German as "Der Ursprung der Angiospermen," Österreich. bot. Zeitschr., Jahrg. 1908, pp. 89–99, 131–161, 184–204.)
30. On Triassic Species of the Genera *Zamites* and *Pterophyllum*: Types of Fronds belonging to the Cycadophyta. Trans. Linn. Soc. Lond. ser. 2, Bot. vol. vii. pt. 7, 1907, pp. 109–127, 3 pls.
31. On a New Pteridosperm possessing the *Sphenopteris* Type of Foliage. Ann. Bot. vol. xxii. 1908, pp. 57–62, 1 pl.
32. Report on the Plant-remains from the Beacon Sandstone. National Antarctic Expedition (1901–1904). Natural History, vol. i. Geology, 1907, p. 48.

33. (Conjointly with H. Hamshaw Thomas.) On the Structure of *Sigillaria scutellata*, Brongn., and other Eusigillarian Stems, in Comparison with those of other Palæozoic Lycopods. Phil. Trans. Roy. Soc. Lond. ser. B, vol. cc. 1908, pp. 133–166, 3 pls., 1 text-fig.
34. (Conjointly with John Parkin.) Studies on the Evolution of the Angiosperms. The Relationship of the Angiosperms to the Gnetales. Ann. Bot. vol. xxii. 1908, pp. 489–515, 3 text-figs.
35. On the Affinities of the Triassic Plant *Yuccites vogesiacus*, Schimper and Mougeot. Geol. Mag. dec. 5, vol. vi. 1909, pp. 11–14.
36. On the Fossil Plants of the Waldershare and Fredville Series of the Kent Coal-field. Quart. Journ. Geol. Soc. vol. lxv. 1909, pp. 21–39, 1 pl.
37. Fossil Plants. Gowans's Nature Books, no. 21, 75 pp., 60 pls. Glasgow, 1909.
38. Recent Progress in the Study of British Carboniferous Plants. Science Progress, vol. iv. 1909, pp. 135–149.
39. (Conjointly with H. Hamshaw Thomas.) A Note on the Structure of the Cortex of *Sigillaria mamillaris*, Brongn. Ann. Bot. vol. xxiii. 1909, pp. 513, 514.
40. Note on a Collection of Fossil Plants from the Neighbourhood of Lake Nyasa, collected by Mr. A. R. Andrew. Quart. Journ. Geol. Soc. vol. lxvi. 1910, pp. 237–239.
41. Notes on a Collection of Fossil Plants from the Newent Coal-field (Gloucestershire). Geol. Mag. dec. 5, vol. vii. 1910, pp. 241–244.
42. A note on some fossil plants from Newfoundland. Proc. Camb. Phil. Soc. vol. xv. 1910, pp. 390–392, 2 text-figs.
43. Plant Life in Alpine Switzerland, being an account in simple language of the natural history of Alpine plants. xxiv + 355 pp., 48 pls., 30 text-figs. Murray: London, 1910.
44. Some Fossil Plants from Western Australia.—III. Palæont. Contributions to the Geology of West. Aust. Geol. Surv. Bull. xxxvi. 1910, pp. 25–28.
45. A Note on a Fossil Wood from Intombi Camp, Ladysmith. Ann. Natal Museum, vol. ii. 1910, p. 233.
46. On the Fossil Flora of the Southern Portion of the Yorkshire Coal-field in North Derbyshire and Nottinghamshire. Proc. York. Geol. Soc. vol. xvii. pt. 2, 1910, pp. 132–155, 8 pls.
47. The Coast Scenery of North Devon, being an account of the Geological Features of the Coast-line extending from Porlock in Somerset to Boscastle in North Cornwall. xxiv + 261 pp., 64 pls., 12 text-figs., and 2 maps. (Dent) London, 1911.
48. The Natural History of Coal. x + 163 pp., 21 text-figs. Cambridge University Press, 1911. (Translated into Russian, 1914.)
49. The Culm-Measures of the Exeter District. Geol. Mag. dec. 5, vol. viii. 1911, pp. 495–7.
50. The Lower Carboniferous (Carboniferous Limestone) Flora of the Ballycastle Coalfield, Co. Antrim. Sci. Proc. Roy. Dublin Society, vol. xiii. n.s. no. 12, 1912, pp. 162–176, 3 pls.
51. The Fossil Flora of the Ingleton Coal-field (Yorkshire). Geol. Mag. dec. 5, vol. ix. 1912, pp. 80–82.
52. A note on some fossil plants from the Kent Coal-field. Geol. Mag. dec. 5, vol. ix. 1912, pp. 97–99, 1 pl.

53. On the Fossil Flora of the Forest of Dean Coal-field (Gloucestershire), and the Relationships of the Coal-fields of the West of England and South Wales. Phil. Trans. Roy. Soc. Lond. ser. B, vol. ccii. 1912, pp. 233–281, 3 pls.

54. On *Psygmophyllum majus*, sp. nov., from the Lower Carboniferous Rocks of Newfoundland, together with a Revision of the Genus and Remarks on its Affinities. Trans. Linn. Soc. Lond. ser. 2, Bot. vol. vii. pt. 18, 1912, pp. 391–407, 3 pls., 1 text-fig.

55. The Fossil Plants of the Forest of Dean Coal-field. Proc. Cotteswold Nat. F. C. vol. xvii. pt. 3, 1912, pp. 321–332, 4 pls.

56. Zwischenstufen zwischen Farnen und Samenpflanzen. Fischer's Handwörterbuch der Naturwissenschaften, Bd. iv. 1913, pp. 212–227, 16 text-figs.

57. On the earlier Mesozoic Floras of New Zealand. Proc. Camb. Phil. Soc. vol. xvii. pt. 1, 1913, pp. 122–131.

58. A Preliminary Note on the Fossil Plants of the Mount Potts Beds, New Zealand, Collected by Mr. D. G. Lillie, Biologist to Captain Scott's Antarctic Expedition in the 'Terra Nova.' Proc. Roy. Soc. B. vol. lxxxvi. 1913, pp. 344–347, 2 pls.

59. On the Discovery of Fossil Plants in the Old Hill Marls of the South Staffordshire Coal-field. Geol. Mag. dec. 5, vol. x. 1913, pp. 215, 216.

60. On the Structure of *Dadoxylon Kayi*, sp. nov., from the Halesowen Sandstone at Witley (Worcestershire). Quart. Journ. Geol. Soc. vol. lxix. 1913, pp. 454–457, 4 text-figs.

61. On the Fossil Floras of the Wyre Forest, with Special Reference to the Geology of the Coal-field and its Relationships to the Neighbouring Coal-Measure Areas. Phil. Trans. Roy. Soc. London, ser. B, vol. cciv. 1914, pp. 363–445, 4 pls.

62. A Revision of the Seed Impressions of the British Coal-Measures. Ann. Bot. vol. xxviii. 1914, pp. 81–108, 3 pls., and 8 text-figs.

63. On the Fossil Flora of the Kent Coal-field. Quart. Journ. Geol. Soc. vol. lxx. 1914, pp. 54–81, 3 pls.

64. Geology of the Kent Coal-field. Trans. Inst. Mining Engineers, vol. xlvii. pt. 5, 1914, pp. 677–714, 1 map.

65. (Conjointly with R. H. Goode.) On some fossil plants from the Devonian rocks of North Devon. Proc. Camb. Phil. Soc. vol. xviii. 1915, pp. 89–104, 2 pls., 3 text-figs.

66. On a little-known concealed coal-field in Oxfordshire. Proc. Camb. Phil. Soc. vol. xviii. 1915, pp. 180–183 (see also Trans. Inst. Mining Engineers, vol. l. pt. 2, 1916, pp. 373–384).

67. Studies of the Geology of the Kent Coal-field.—Part. I.: The Coal-Measure record of four borings. Trans. Inst. Mining Engineers, vol. l. pt. 2, 1916, pp. 351–372.

68. On the Fossil Floras of the Coal-Measures of South Staffordshire. Phil. Trans. Roy. Soc. London, ser. B, vol. ccviii. 1916, pp. 127–155, 3 pls., 3 text-figs.

69. The Structure of the South Staffordshire Coal-field, with special reference to the concealed areas and to the neighbouring fields. Trans. Inst. Mining Engineers, vol. lii. pt. 1, 1916, pp. 35–70.

70. The Earlier Mesozoic Floras of New Zealand. New Zealand Geological Survey. Palæontological Bulletin No. 6, 80 pp., 14 pls., 12 text-figs. Wellington, N. Z., 1917.
71. A Note on Submedullary Casts of Coal-Measure Calamites. Geol. Mag. dec. 6, vol. v. 1918, pp. 212–214.

The following memoirs (72 to 79), most of which are as yet unpublished, were left in various stages of completion at Dr. Arber's death. Their provisional titles are as follows:—

72. (Conjointly with F. W. Lawfield.) On the External Morphology of the Stems of Calamites, with a Revision of the British species of *Calamophloios* and *Dictyocalamites* of Upper Carboniferous Age.
73. A Sketch of the History of Palæobotany, with special reference to the Fossil Flora of the British Coal-Measures.
74. Remarks on the Organisation of the Cones of *Williamsonia gigas* (L. & H.).
75. On the Fossil Flora of the Southern Portion of the Yorkshire Coalfield.—Part II. North Derbyshire.
76. A Revision of the British Upper Carboniferous Species of the genus *Lepidostrobus*, Brongn., preserved as incrustations.
77. Critical Notes on Coal-Measure Plant-Impressions.—I. On *Lepidodendron lycopodioides*, Sternb., *L. ophiurus*, Brongn., and *L. loricatum*, sp. nov.—II. On *Neuropteris obliqua*, Brongn., and *N. fallax*, sp. nov.
78. A Critical Review of our present knowledge of the two Devonian Land Floras.
79. A Synopsis of the Coal-Measure Flora of Great Britain.
80. Studies of the British Coal-Measures, considered more especially in the light of recent Palæobotanical research.
81. (Text-book.) The Principles of Fossil Botany.
82. (Elementary Text-book.) Introduction to Palæobotany.

[A. A.]

William Edward Balston, who had been a Fellow since 6th June, 1878, was born at Maidstone on 8th March, 1848, and died at Barvin, Potter's Bar, on 19th December, 1918. He was educated at Eton and at Oxford, and was deeply interested in all kinds of natural history. He was a generous patron of science, especially palæontology, and made valuable gifts both to the British Museum and to the Oxford University Museum. He was also an observant cultivator of orchids. [A. S. W.]

Frederick James Bridgman joined the Society on the 2nd December, 1909. After being for some years in business with his father, during which time he attended the evening science classes at the Birkbeck College, he determined to devote himself to zoology, and entered the Royal College of Science as a full-time student in 1904. He took his Associateship in Zoology, and acted for a time as Demonstrator in the Zoological Department under the late Prof. A. Sedgwick. Subsequently he joined the staff of the Marine Biological Association at Plymouth as an Assistant

Naturalist. There he acquired a wide knowledge of marine biology, and was engaged on an extensive research on the otoliths of fishes in relation to age-determination, the results of which are still unpublished. He also collaborated with Prof. A. Dendy, under whom he studied zoology at the Royal College of Science, in the preparation of a monograph on the structure and development of *Grantia compressa* for the Liverpool Marine Biology Committee Memoirs. On leaving Plymouth he was appointed Assistant in the Department of Zoology, University College, London, which post he held at the time of his death.

Bridgman was a loyal and helpful colleague, and as a teacher was extraordinarily successful, sparing himself neither time nor trouble to make his teaching interesting and effective.

Never of a very robust constitution, he died whilst still a young man on September 28th, 1918, after a short but painful illness, greatly to the regret of his friends and colleagues and his old students. [J. P. Hill.]

Sir Frank Crisp, Bt. (1843–1919).—The heaviest loss which has befallen the Society for a long series of years has been felt in the death of Sir Frank Crisp, at Friar Park, Henley-on-Thames, on the 29th of April last.

He came of East Anglian stock, the only child of his father, John Shalders Crisp, a native of Norwich, who was trained in the noted printing business of Childs, of Bungay, Suffolk, now a provincial establishment of Richard Clay & Sons, Ltd. His mother, Harriet, was the only child of John Childs, the printer, a sturdy opponent of Church rates and the monopoly of Bible printing enjoyed by the Universities and the King's printers. In 1843 his father was a member of the firm of Ward & Co., publishers, of 27 Paternoster Row (the predecessors of Hodder & Stoughton), and was living in Nelson Square, a quiet, secluded spot on the east side of Blackfriars Bridge, not far from Southwark Street. His son, the subject of this notice, was born on the 25th October, 1843, and was educated at private schools, the last being that of Central Hill House (Mr. William Hainworth), and then at University College School, Gower Street. His bent was originally to become an engineer, but a few months before leaving school he changed his mind and determined upon the law as his future profession, giving all his spare time to attending the law courts. At the age of 16, he was articled to the firm of Ashurst & Morris, being introduced to Mr. John Morris, then the sole surviving partner, by his uncle, Mr. Charles Childs. The firm then occupied No. 6 Old Jewry, a rabbit-warren of rooms at different levels, greatly in contrast to the present habitation of the firm in Throgmorton Avenue, which is upon the site of a part of the garden belonging to the Drapers' Company. By private study he passed the matriculation examination of London University, graduated B.A. and took a further degree of LL.B.

In 1867 he married Catherine Howes, the only daughter of George D. Howes, four sons and two daughters forming their family.

He was admitted a solicitor in 1869, with honours, and his legal reputation grew until he was admitted into partnership under the title of Ashurst, Morris, Crisp & Co. While working hard in the City, and bringing home piles of papers to investigate far into the morning, he happily had a hobby to turn his thoughts when free at times from that imperious mistress, the law—namely, the use of the microscope and books upon that instrument. Early acquiring a perfect museum of splendid instruments and apparatus, he set himself to build up a complete library of books on the microscope, and before many years had elapsed he was able to say that he possessed every volume catalogued by Roper in his account of his own library. In 1870 he became a Fellow of the Royal Microscopical Society, served on its Council from 1874, and in 1878 was chosen one of its secretaries. Here he had scope for his energies. Dr. Henry Lawson, the editor of the Society's 'Journal,' had just died, and Mr. Crisp at once remodelled the 'Journal,' gathered round him a band of specialists, and, besides the reports of activities of the Society, copious summaries and papers at home and abroad were printed in the pages, very largely at the expense of the secretary, whose purse was readily drawn upon to improve the publication in text and illustration.

He was elected a Fellow of our Society on the 16th June, 1870, and thus had nearly completed his 49th year of Fellowship. He served on the Council from 1879 almost continuously, and was a member of it to the day of his death. On the death of Frederick Currey in 1881 our late Fellow was elected his successor as Treasurer, and held that office till May 1905, a period of 24 years, when the pressure of his legal work obliged him to resign. The frontispiece of the Society's 'Proceedings,' 1904–5, is from a photograph of our former Treasurer.

For more than forty years Sir Frank had loved that part of the Thames Valley of which Henley is the centre, and after many visits to that town he bought an estate with two houses upon it, and began a gradual rebuilding of the principal house until it assumed its present shape. At the same time the grounds were laid out under his direction, and an Alpine garden of unique distinction was set out. The 'Guide' published to the gardens shows the quaint and whimsical fancies in which the owner used to indulge, the visitor being early met by the warning "Don't keep off the grass." This volume, the only one of which he was the author, ran through several editions, and the profits of its sale, with the entire receipts for admission to the garden on Wednesdays in summer, were devoted to local and gardening charities.

Of his great business capacity this is hardly the place to speak; but I may record that his knowledge of company law was admittedly unique, and his experience was repeatedly used on Committees and Commissions. These qualities shone out in Council, and many

awkward questions were got over or smoothed away by his acute mind. His quick grasp of essentials and strong common sense enabled him repeatedly to brush aside legal cobwebs which would have hindered the work in hand. As an instance, he was detained in town from joining the Council punctually. Meanwhile a certain member of the Council had spoken, saying that the course of action favoured by the majority present could not legally be carried out, when Sir Frank entered. On his being seated, the President stated the condition of things, and that the majority of the Council inclined to such and such a course. "Certainly; why not?" was the downright and brief remark from Sir Frank, which completely altered the aspect of things from that prevailing before his entry.

Mention has been made of his open-handedness as Secretary of the Royal Microscopical Society. The same generous spirit was shown to the Linnean Society, as the following instances will prove:—

The cost of the installation of the electric light was borne by him; he gave the sculptor's model of the statue of C. v. Linné (which stands behind the Royal Library, Stockholm); the table for the Meeting-Room was provided by him, also, at a later date, the clock and surrounding oak moulding; the cost of the Supplementary Charter; a Fund of £200 for Microscopical Research; the Wallichian cabinets when the plants were presented to Kew, and new shelving to accommodate the Wallace library in 1915; the phototyped copy of the Vienna 'Codex Aniciae Julianae' of Dioscorides; the 17 volumes of 'Lindenia'; and a complete set of Bulliard's volumes on the French Flora.

He died, as noted above, at his country seat on the 29th April, and was buried at Henley Cemetery on the 3rd May, amid a large gathering, the parish church being crowded, Sir David Prain, our President, representing this Society.

He is succeeded in the title by his eldest son, Sir Frank Morris Crisp, 2nd baronet.

Our late colleague, with pathetic prescience, caused to be cut on the walls of one of the lodges at Friar Park the following well-known lines of Horace (Odes II, xiv.):—

> Linquenda tellus et domus et placens
> uxor, neque harum, quas colis, arborum
> te præter invisas cupressos
> ulla brevem dominum sequetur.

In closing, a personal note may be allowed in memory of a friendship of nearly seventy years—from boyhood to old age—only now broken by death; the loss is irreparable. [B. D. J.]

Anne Casimir Pyramus de Candolle, F.M.L.S., the eldest son of Alphonse Pierre de Candolle, also one of our Foreign Members, and Jeanne Victoire Laure Kunkler, was born at Geneva on 20th February, 1836. He received his early education

in his native city, and in 1853 passed from the Gymnasium there to Paris, where he devoted his attention especially to the physical sciences, becoming Bachelor of Science in 1853 and Licentiate in 1856. During the period of study at Paris young de Candolle spent some part of the year 1854 under the roof of our late distinguished Fellow, the Rev. M. J. Berkeley. On his return to Geneva Casimir de Candolle at once devoted himself to botanical work as the assistant and colleague of his distinguished father. On the death of Alphonse de Candolle in 1893, the Foreign Member whose loss we now deplore was chosen by us to fill his father's place in our list, and as the successor of that eminent student was destined to carry on the traditions of two generations in that botanical shrine in the Cour St. Pierre, so well known to serious systematic workers of every school. How worthy of the great trust which the accident of birth imposed upon him Casimir de Candolle was to prove is a matter of common knowledge to all those of every country who have had occasion to invoke his aid in correspondence with reference to Candollean types, and to those who may have found it necessary to visit the De Candolle Herbarium and examine its treasures themselves. If his own especial studies have not covered so wide a field as that in which his grandfather's and his father's labours lay, this has been due to the circumstance that the facts of science are so multiplied in all parts of that field as to render it impossible for a single worker now to deal with more than a limited portion of what a century ago might easily be reviewed by one student of nature. That the narrowing of his field of study was not due to any lack of devotion those who had the honour of the acquaintance of Casimir de Candolle know. That the quality of the work he did bears the most critical comparison with that done by his eminent predecessors is equally well known to those who have had occasion to follow his studies in the families Piperaceæ and Meliaceæ, with regard to which he had long been recognized as the greatest living authority. It is not necessary here to recapitulate the contributions of Casimir de Candolle to natural knowledge; they are written in the chronicles of the science he served so faithfully; they are open to the study of all who may consult them, and will live with us and with those who follow us. It is also impossible to convey to our successors, or to those of our contemporaries who had not the invaluable privilege of knowing him in person, what the death of Casimir de Candolle means to those who had the honour of his acquaintance. Modest as he was erudite, in him were combined a courtesy as unfailing as it was unaffected and a willingness to assist those in need of information as great as the charm of manner with which he imparted the knowledge he was so able and so willing to convey. Not botany alone, but all that is best in human experience is the poorer for the death of Casimir de Candolle, which took place after a prolonged and painful illness at Vallon, near Geneva, on 3rd October, 1918. [D. Prain.]

The Rt. Hon. John Forrest, 1st Baron Forrest of Bunbury, did not live long to enjoy the title which was conferred upon him in May 1918, dying on the 3rd of September of that year.

He was born at Leschenault, West Australia, on the 22nd August, 1847, the third son of William Forrest, was educated at Bishop's School, Perth, and when 18 years of age, in 1865, he entered the Survey Department. Four years later he led the expedition in search of Dr. Leichhardt's party, the first of several which he conducted, through the centre of Australia, nearly 2000 miles in extent, in 1874, with horses only, and for this he was given 5000 acres by the Government. He became the first Premier of the Commonwealth, and was continuously and fully employed on State business to the close of his life. He published 'Explorations in Australia,' 1875, and 'Notes on Western Australia,' 1884–87. In 1876 he married Margaret Elvire, eldest daughter of Edward Hamersley, J.P., of Pyrton, W. Australia. The honours accorded to a strenuous and successful statesman were: The Privy Councillorship, 1891; K.C.M.G. in 1891, G.C.M.G. in 1901, and LL.D. of Cambridge, Adelaide, and Perth; Knight of the Order of the Crown of Italy, 1875. His election as Fellow of the Linnean Society took place on the 16th June, 1881; he also belonged to the Geological and Royal Geographical Societies, and was Hon. Member of the Geographical Societies of Rome, Vienna, and Petrograd.

[B. D. J.]

The Rt. Hon. Sir Edward Fry, G.C.B., D.C.L., LL.D., F.R.S., F.S.A., F.L.S., leaves behind him a noble record of public service. Eminent as a lawyer and a judge, he won yet higher distinction as a great arbitrator, having been called upon by successive Governments to decide in many questions of both national and international importance. Whatever the task he undertook, whether for public or private welfare, he could be relied upon for perfect integrity, swift mastery of facts, and a singular fairness of judgment.

Edward Fry belonged to a well-known Quaker family, and was born in Bristol, November 4th, 1827. As a boy, he and his brothers were enthusiastic collectors of flowers, exploring their neighbourhood, which included the prolific hunting-ground of St. Vincent's Rocks, in search of rare plants. He was educated at Bristol College, and University College, London, where he took a B.A. degree, with honours in classics and physiology. Throughout his life and amidst the pressing occupations of a legal career, his classical and scientific studies were never allowed to drop. The writings of the ancient authors were alive to him, and, with the aid of a retentive memory, were a continual possession. With wide interests in many branches of science, in archæology, astronomy, geology, it was to botany that he devoted most attention. He published in 1892 a little book, 'British Mosses,' of which a second edition appeared in 1908. This gives a simple

introduction to the study of mosses; the reader is taken, as it were, into the author's confidence, and the structure of the moss-plant and its life-history are explained to him, the relations of mosses to other plants is discussed, and their distribution over the earth's surface in the past and present is briefly reviewed. In recommending the study of mosses "to any old or young, who really love Nature," he writes, "I find myself, whenever in the country, surrounded by a world of beauty and interest which I only dimly perceived before I entered on the study, though I have never, I hope, been entirely unobservant of things around me." In 1911, in collaboration with his daughter Agnes, he wrote a book on similar lines on 'The Liverworts.' Also, with his daughter's aid, he wrote in 1899 a treatise entitled 'The Mycetozoa, and some questions which they suggest,' a work which can hardly fail to excite interest in these strange and beautiful organisms. A special charm is to be found in all these books from the suggestive manner in which many problems of far-reaching importance are lightly touched upon. His holidays abroad were enriched not only by historic associations, but by the study of the characteristic floras of the countries visited, and collections of plants were brought home from Italy, Greece, and Egypt, to be carefully named and added to the family herbarium. His beautiful garden at Failand, Somerset, was replete with interesting and unusual plants and—with the small pinetum which he laid out—formed an unfailing source of enjoyment.

To those who were privileged to be admitted to the intimacy of his home circle, his wide experience, his pleasure in sharing his interests with others, and his kindly sense of humour made him an ideal host and companion. He died at Failand, October 18th, 1918, within a few days of completing his ninety-first year.

[G. Lister.]

By the death, on February 19th, 1919, of Frederick DuCane Godman, the Society has lost one of its most distinguished Fellows. It is unnecessary to repeat here the details of his long life devoted to science, for these have been recounted by many friends, and best of all in the autobiographical sketch, written with characteristic modesty, which appeared in 1915 in the Introductory Volume of the 'Biologia Centrali-Americana,' when Godman was in his eighty-second year. The 63 volumes of the 'Biologia' and the immense additions to the British Museum of Natural History will preserve his memory for all time.

Here we prefer rather to dwell on his personality. We remember with pleasure that the most recent of his many honours was the award in 1918 of the Linnean Gold Medal by our Society; and we know of the pleasure with which he received this evidence of the appreciation of his brother and sister naturalists. Godman never thought of recognition or reward, but when recognition came he accepted it in the spirit in which it was offered, and it gave him, as he freely told his friends, the keenest pleasure. One

regret he felt, that his comrade for forty-four years, Osbert Salvin—"more than a brother to me," as he said to the present writer on Salvin's death in 1898—was not with him to achieve the completion and share in the appreciation of their great work.

Few men have had greater opportunities than Godman, and none can have used them more fruitfully. And this was not only true in the distinction and the extent of his contributions to science, of which the world knows, but also quietly in acts of kindness and in sympathy. Such were the subjects of his correspondence with me in recent years, the last only a few days before his death.

Here in the Linnean Society we shall long remember his tall erect figure, his fine intellectual head, and his unfailing courtesy.

[E. B. Poulton.]

For the sake of those who cannot readily turn to the Introductory Volume of Godman and Salvin's 'Biologia,' the following brief account may be of interest:—

Dr. Godman was the third son of Joseph Godman, of Park Hatch, Surrey, was born in January 1834, and at the age of ten went to Eton, but an attack of "low fever" three years later compelled his retirement, so that for some years he was quite unable to work. His education was continued under tutors till he was eighteen, and then he travelled to the Mediterranean and Black Sea. In 1853 he entered Trinity College, Cambridge, and there formed that friendship with Osbert Salvin which ended only with Salvin's death in 1898 (Proc. Linn. Soc. 1898–99, pp. 59–61). 'The Ibis' was started by a group of friends in Alfred Newton's rooms at Magdalene College in 1858, as the organ of the British Ornithologists' Union then founded.

Mr. Salvin paid a visit to Central America in 1857 with Geo. Ure Skinner, and what he then saw so whetted his appetite that he paid a second visit to Guatemala early in 1859; Godman joined Salvin on his third expedition in August 1861. A trip to the Azores in 1865 was followed by his well-known volume 'Natural History of the Azores' in 1870, to which H. C. Watson contributed the botany.

The joint collections of the two friends having been accommodated in various abodes, at last found a permanent home at 10 Chandos Street, Cavendish Square till the death of Salvin. In 1907 the house was given up, the library removed to Godman's house in Pont Street, and the collections handed over to the British Museum.

The publication of the great work by which the two friends will ever be celebrated was begun in 1879 and was closed in 1915, an array of 63 quarto volumes. When the ideal author-partnership was severed in 1898, 141 parts of Zoology, completing 13 volumes, 5 volumes of Botany and 9 parts of Archæology had been published: the remaining 74 of Zoology, and 8 parts of Archæology being completed under Dr. Godman's care.

Dr. Godman was elected into our Society 19th November, 1863, and became F.R.S. in 1882; he also belonged to the Geological and Entomological Societies, was a Trustee of the British Museum, and D.C.L. (Oxon.). He married Edith Mary, daughter of the late J. H. Elwes, of Colesbourne, who died in 1875, and secondly Alice Mary, daughter of the late Major Percy Chaplin, J.P., who survives him.

A portrait of our late Fellow will be found in the Introductory Volume of the 'Biologia' already mentioned. [B. D. J.]

John Henry Lace, C.I.E., became a Fellow of our Society in 1888. He was born in 1857 and obtained the Diploma at the National School of Forestry at Nancy in France in 1881, passing out second of the English students of his year. He joined the Forest Department in India at once and was posted to the Punjab, in which Province he remained until 1900. In that Province, and especially in the Himalayan Ranges of Chamba, he not only did excellent work in forest organization, but made large collections and studied the botany of the mountain region. Part of his Punjab service was spent in the investigation of the Forest Flora of the then newly-organized Forest Circle of British Baluchistan, and his extensive collections were sent home and resulted in the publication by himself and Dr. Hemsley in our Volume xxviii. (1891) of "A Sketch of the Vegetation of British Baluchistan," which still remains the chief authority on the Forest Flora of the Quetta region. In 1900 he was transferred to Calcutta and Simla as Assistant Inspector-General of Forests and Superintendent of Working Plans, and he naturally devoted his leisure to a study of the Simla flora and the increase of his collections. In 1901 he became Conservator of Forests in Bengal with headquarters at Darjeeling, where a hill flora of a different character awaited his researches; but it was later on, in 1904, on his transfer to Burma, that he began the work that was the chief one of his botanical career in India and with which his name will be chiefly identified. As a Conservator of Forests, and later as Chief Conservator in Burma, he did very fine work. As the writer of a notice in the 'Indian Forester' remarked, "he was a great critic and was at times hard to please, but always helped in anything that was sound and was an excellent man to serve under." As the same writer went on to say, his chief interests were in botanical study, especially in the Maymyo Hills and the Shan States, and he prepared his useful and accurate "List of the Trees, Shrubs and Climbers of Burma," which is now the standard reference-book for Burma Forest Officers. At one time he officiated as Principal of the Forest College at Debra Dun, and at another as Inspector-General of Forests, returning thence to Burma, which he again only left on his retirement in 1913.

His large collections were distributed most generously, a nearly complete set to Kew, others to the Calcutta Herbarium, and that

at Dehra Dun, and others to private friends, and since his death his own set has become the property of the Herbarium of the Royal Botanic Garden at Edinburgh. The specimens were always beautifully prepared and very carefully labelled by himself. After his retirement he spent much time at the Herbarium of the Royal Botanic Garden at Kew, where, with the help of Mr. W. G. Craib and others of the Kew staff, he continued the elaboration of his Burma List, and published many new species in the 'Kew Bulletin.' He also then commenced work on a Forest Flora of the Maymyo Hills, unfortunately left incomplete at his death, though there is hope that it may be finished by others.

J. H. Lace married the eldest daughter of Mr. W. H. Reynolds, F.R.G.S., the Superintendent of Indian Forest Surveys, and leaves a widow and three daughters. He settled at Exmouth in Devonshire. After the war broke out he was indefatigable as a member of the Exmouth Volunteers and as a special constable, and his sad death on June 9th, 1918, was due to chill caught while on duty. Had he been spared to leave such duties at the end of the war, he would undoubtedly have increased very much the authority of his name as the chief writer on the Botany of Burma, and especially of the Upper Districts which did not come within the purview of S. Kurz's work of 1877.

[J. S. Gamble.]

By the death of Dr. Alberto Löfgren, F.L.S., Brazilian botany loses its most capable and expert local student. Born in Stockholm in September 1854, he studied at the University of Uppsala, but just before taking his doctorate, was appointed assistant to Mosén upon a Regnell expedition to southern Brazil, spending the years 1874–7 upon the botanical exploration of the States of São Paulo and Minas Geraes. Taking a great fancy to the country, he remained there at the close of the expedition, and was for the next three years employed upon the Paulista Railway. From 1880 to 1886 he was teaching in São Paulo city, and was then appointed botanist and meteorologist to the Geographical Commission of the state. In 1898 he started a botanical garden in São Paulo, which had but a chequered career. Subsequently he was appointed botanist on the Commission for investigation of the Dry zone of Brazil, and in that capacity explored most of the north-eastern states of the republic. Finally in 1913 he was appointed chief of the section of vegetable physiology in the Rio Botanic Gardens, and died in Rio on August 30, 1918.

Löfgren devoted himself with great energy and success to the study of the flora of Brazil, and a reference to the later volumes of the 'Flora' of Martius will show how much that work owes to his labours. His own publications were comparatively few, a result largely due to the generous way in which he always helped other workers, at whatever cost in time and trouble to himself. He

published several important papers dealing with ecological and other distribution of the plants of Brazil, and his last work was a monograph (in the Archivos of the Rio Gardens) of *Rhipsalis*, a worthy beginning of the monographs which he proposed to issue of all the Brazilian Cactaceæ, a family to which he had devoted special attention.

A past-master of languages, speaking with ease and fluency no fewer than nine (including Russian), he had friends among all the many races that go to make up the complex population of Brazil, though he himself had become almost completely Brazilianised, speaking Portuguese as a second mother tongue. A man of unassuming habit, and the most generous and helpful disposition, he was loved by all those with whom he came into contact. He was my colleague for eighteen months, and I have never had a more loyal and helpful assistant. Under his care the laboratories and herbarium of the Rio gardens were brought into thoroughly efficient condition, and all who visited the gardens for purposes of research will join with me, I am confident, in expressing their gratitude to him for his invaluable aid in the study of the gigantic flora of Brazil, of which he had by far the most complete knowledge of any botanist of his time.

His portrait will be found in Wittrock's 'Iconotheca Botanica,' t. 36, and a brief notice on p. 182. His collections are mostly in São Paulo and Rio de Janeiro, with duplicates at Copenhagen, Stockholm, Berlin, and in the Glaziou collection. [J. C. W.]

Alfred Merle Norman, son of John Norman, D.L., Iwood House, Somerset, was born in Exeter, August 29, 1831. That he was not unmindful of his birthplace may be inferred from the fact that in concert with Thomas Scott, LL.D., F.L.S., seventy-five years later he published an important volume on the 'Crustacea of Devon and Cornwall,' having indeed in the interval on nine occasions visited those counties for natural history investigations. It was just after the publication of the volume above mentioned that the gold medal of the Linnean Society was awarded to Norman. In presenting it Professor W. A. Herdman, then President, succinctly showed the amount, the variety, and the high value to biological science of the medallist's labours. Thus in our 'Proceedings' for 1906, pp. 30–32, we have an appreciation of his services by a distinguished expert. The reply of the recipient is not recorded, but those who were present on the occasion may remember the unaffected simplicity with which he described the surprise that the award had caused him. Yet his merit had not been without earlier recognition. He had received the medal of the "Institut" of France for his work on board the French Government exploring vessels in the Bay of Biscay.

Joining this Society in 1880, he was elected to the Council 1901–2. He was made an hon. D.C.L. of Durham University

in 1883, an hon. LL.D. of St. Andrews in 1897, and in 1890 had the somewhat unusual honour of being elected F.R.S. at the first asking.

If Norman was not a born naturalist, he was something very like it. We are told that in his early years he studied botany under the fostering care of his elder brother. In his school days at Winchester he was an entomologist. At Christ Church, Oxford, before taking his B.A. degree in 1852, he was already busy with the Mollusca of Oxfordshire. He was ordained in 1856, and thenceforward may be said to have lived a double life in a truly remarkable manner. For, with scientific energy and results by themselves conspicuous, he combined devotion to duty in the ecclesiastical sphere. Without entering into details, a few dates may be given as indicating what was thought of him in his own profession. He was curate of Houghton-le-Spring from 1864 to 1866; Hon. Canon of Durham in 1885; Rector of Burnmoor from 1866 to 1895, and then, under pressure, Rector of the important living of Houghton-le-Spring and Rural Dean from 1895 to 1898. These last appointments he resigned under medical advice which could not be neglected.

By Herdman's admirable record of Norman's scientific career down to 1906, the main part of this stirring biography has been already told, though the President's concluding remark was well justified in looking forward to "services which we hope may be continued for years to come." Accordingly we find Norman describing new species of Amphipoda in 1908, and in that year delivering a presidential address on "The Celtic Province: its extent and its marine fauna"; while in the following year he deals with the Crustacea of the Channel Islands, and joins G. S. Brady in an account of the Crustacea of Northumberland and Durham. In 1911 he published in the 'Transactions' of this Society notices of some remarkable Harpactid Copepoda from the Clyde, and in 1913 the completion, as far as possible, of the description of his *Synagoga mira*—a strange cirripede from an Actinozoan host which Lo Bianco had submitted to him when he was working at the famous Naples Aquarium in 1887—a species which had not since been found though diligently sought for. Norman was in fact a prolific author, although in a letter, Nov. 21, 1877, he says, "I love observing and hate writing." He only meant writing for the press. In private he was an excellent correspondent, as A. O. Walker, F.L.S., and many another of his colleagues in natural history adventure can testify.

On May 30, 1877, Norman writes: "I have been in Edinburgh for a fortnight staying with Sir Wyville Thomson, and going through for him the 'Challenger' Crustacea. These I separated out into Orders so that they are ready to be distributed to those who may take them in hand. It is a very extensive collection and will take an immense amount of working through, and I really do not know where men are to be found who can do it." It is

not necessary here to repeat the tentative suggestions he made, since the plan actually followed is before the world. In that same year occurred a check to what seems to have been an almost unbroken period of vigorous health. Writing from Burnmoor Rectory on August 26, 1877, he explains the disconcerting incident:—"In company with two companions I ascended Ben Nevis. It was clouded at the top but there were fine views down into the gorge in which I had been the night before and fine distant views from half-way up. I had reached the bottom and was going across a piece of marshy heath when in exuberance of spirits I took a long leap as far as I could jump and had the misfortune to come down with my left heel on a piece of rock; after which I turned a couple of somersaults. I was a mile and a half from the hotel, and in about an hour and a quarter I got there with the help of the guide. But there was an end of walking as I had ruptured some of the ligaments of the knee." The consequences of this accident were faced with resolute hopefulness by the patient, but it is easy to understand that the process of recovery was painful and tedious. On Nov. 14 he writes, "My leg has made wonderful progress during the last fortnight and I may now say is *well*, though of course not very strong." In the meantime he had been singularly cheered by the discovery of a box full of important Amphipoda which had been missing for fourteen years owing to a wrong label—an expedient for occultation worthy of living crustaceans!

A time came when Norman, with intellect still unclouded, was forced to use an amanuensis for his correspondence and a bath-chair for out-of-door exercise, and though his death was prematurely recorded, not much later he peacefully closed his life at Berkhamsted on October 26, 1918. For many years his steady routine work at home had been wonderfully diversified and enlivened by his brief holidays elsewhere. One while he is with Walker at Colwyn Bay, at another with John Murray at Cumbrae, or with David Robertson in Ireland; six journeys he made to the fruitful waters of Norway; he worked at the Plymouth Marine Laboratory as well as at the Neapolitan; his visit to Madeira for health produced a study of the island's terrestrial Isopoda and of its marine Mollusca. He proved himself to many of us an affectionate friend, given to hospitality, to his parishioners an earnest and trusted clergyman, and to natural history circles an authority of high distinction. [T. R. R. Stebbing.]

Prof. Henry George Plimmer, F.R.S.—Prof. Plimmer was born at Melksham, in Wiltshire, on January 29th, 1856 *, and died on June 22nd, 1918, from cancer, the disease he had spent many

* This is the year given by his sole surviving uncle, but possibly, as he himself thought, it was 1857. For much of the material embodied in this notice I am indebted to Mrs. Plimmer, who kindly supplied it from a short autobiography her husband left behind him.

years of his life attempting to combat by experimental and microscopic investigation. He was a delicate child, whom his parents did not expect to rear, and at an early age lost the use of one eye from ophthalmia. He was sent to a preparatory school at the age of four, and to another school at Devizes when between six and seven. After the death of his father, a medical practitioner with pronounced sporting proclivities, in 1865, he was transferred to Shaw House School, where he stayed till 1870, when he went to live with his mother at Ironbridge, in Shropshire, where soon afterwards, through the influence of an uncle who was employed by the firm, he became a clerk in the office of the Coalbrookdale Company. Dissatisfied with this work, he wrote in 1877 to Dr. J. H. Galton, formerly his father's assistant, to inquire about the possibilities of his adopting the medical profession, with the result that a year later he became the "unqualified assistant" of Galton and his partner, Sydney Turner, at Norwood, where in 1880 he was joined by his mother, he being at that time a student at Guy's Hospital, which he had entered in 1878, and where, after securing his medical qualifications of L.S.A in 1882 and M.R.C.S. in 1883, he held the appointments of house physician and house surgeon. It was here that he became associated with Dr. Samuel Wilks, who inspired him with his interest in pathology. These years of his life were years of strenuous labour, rewarded in 1883 by his being taken into partnership by Galton and Turner.

As a general practitioner in a London suburb he would have been lost to science; but the turning-point in his life came in 1887, when he married Helena, the widow of Alfred Aders. Five years later he retired from practice to devote himself to bacteriological research with Prof. Crookshank at King's College. His discovery in 1892 of "Plimmer's bodies" in cancer led to an acquaintance with Armand Ruffer, with whom he worked both at the College of Surgeons and at the newly established British Institute of Preventive Medicine. He became Pathologist to the Cancer Hospital in 1894 and Lecturer in Bacteriology at St. Mary's Hospital in 1895, succeeding Silcock as Pathologist to that institution in 1899.

On the death of his mother, to whom he was deeply attached, in 1896, he moved from Sydenham, where she had been living, to St. John's Wood, and in her memory he founded the Eliza Kerslake Prize at St. Mary's Hospital *. After his appointment in charge of the cancer laboratories at the Lister Institute in 1902, he resigned his posts at the Cancer and St. Mary's Hospitals, being succeeded at the latter institution by his friend Dr. Almroth Wright, and in 1906 he undertook research work upon trypanosomiasis for the Tropical Diseases Committee of the Royal Society. In 1907 he accepted the post of Pathologist to the Zoological Society, and in 1910 achieved the final and only

* Two years after the death of his father Plimmer's mother had married John Kerslake, an engineer, of Bath, who died five months afterwards.

honour he desired—the election to the Fellowship of the Royal Society. During the war he served on the War Office Committees for the investigation of Tetanus and Trench Fever, and was made Professor of Pathology at the Imperial College of Science, a post which he held till his death.

It is needless to enumerate all the scientific societies, medical and otherwise, of which Plimmer was a Fellow. His taste for microscopy and for microscopical technique, of which he was a master, attracted him in 1883 to the Royal Microscopical, of which he became President in 1911–1912. He joined the Linnean Society in 1890, and was elected to the Council and Vice-Presidency in 1917. He was closely in touch with many of the pathologists on the Continent, where his work was well known, and was a member of the Deutsche Komité für Krebsforschung and of the Deutsche Pathologische Gesellschaft. He was the author of a large number of papers on a great variety of subjects, the most important being those relating to the diseases caused by blood-parasites, especially sleeping sickness, for the treatment of which he introduced the use of antimony compounds.

My acquaintance with Dr. Plimmer, which began in 1907, when he succeeded Dr. Seligman as Pathologist to the Zoological Society, rapidly developed into a mutual friendship and esteem which lasted to the day of his death. During his ten years' tenure of that post I saw him almost daily at the Gardens or elsewhere, and the following paragraphs contain my impressions of him, with which others may or may not agree.

His appearance was singular, some would say eccentric. He was of medium height, upright in carriage and spare in build, but lacking in muscular development and physical strength. Constitutionally delicate, he was susceptible to cold and draughts, and an innate timidity of temperament was shown by his fear of thunderstorms and, latterly, by his terror of air-raids. The stern cast of his countenance in repose belied his general character, which was full of fun, a merry twinkle of the eye or a genial smile brightening his whole expression in conversation. His face was shapely, his complexion dark, and he wore whiskers, moustache, a short-trimmed beard, and spectacles. His complete disregard for convention in fashion was shown by his invariable custom of wearing at all seasons, irrespective of weather, an Inverness cloak and a soft, broad-brimmed felt hat of the kind known as a "wide-awake." This, and his habit of brushing his black hair straight back from his high forehead and temples and allowing it to grow long on the collar of his brown velvet jacket, gave him a decidedly foreign appearance, distinguishing him at once in any crowd of ordinarily attired Englishmen.

To state that it was always easy to get on with him would be quite untrue. Ordinarily it would have been difficult to find a pleasanter colleague; but when worried or overstrained, perhaps from allowing preoccupation with his work to interfere with meal-times, he was subject, like other men similarly constituted, to passing fits of irritability, requiring patience to deal with at the

time and liable to give a wrong impression of his true nature to strangers and to those who did not know how to take him. Fundamentally he was eminently reasonable and nice, and exceedingly kind-hearted and sympathetic, many a kind action helping the Zoological Society's employés or friends less well-off than himself standing to his credit.

In sport and athletics he had no interest whatever, and he probably never played a game in his life. Hence the time most boys and young men give to these pastimes he had devoted to the cultivation of his innate literary and artistic tastes. His acquaintance with the classics was quite unusual in a scientific man, and amongst modern writers of fiction his personal friend Meredith, and Hardy, were his favourites. He was devoted, too, to architecture and paintings, especially of the Italian schools. But, apart from pathology, the outstanding interest of his life was music. I have heard him described as one of the best amateur pianists in London, and his friends will long remember the social gatherings in the large music room in his house in Hall Road, St. John's Wood. Incongruous as it may seem, he added to these attributes a knowledge of cookery any *chef* might envy, and an appetite and delicacy of palate which can only be described as Epicurean. Exceedingly sociable and a great talker he was welcomed everywhere, much of his spare time, which was little enough, being spent at the Savile Club. He was also a prominent member of the Omar Club and one of the founders and treasurer of the Lucretian Dining Club.

A peculiarity in his method of pathological research was that he never touched a specimen with his hands, never even using indiarubber gloves for the purpose. The bodies were opened and the organs sliced under his directions by the laboratory assistant while he stood by and examined the sections with a reading-glass. The macroscopic appearance of all the organs, whether diseased or sound, was noted on paper at the time, to be copied later in the Zoological Society's pathological books, and to these records were subsequently added the results of his examination of the slides containing blood-smears and sections of the diseased organs. The daily methodical pursuit of this line of research on practically all the vertebrated animals that died in the Gardens for a space of ten years filled 20 volumes of records of the incidence of the diseases of wild animals in captivity. A brief statistical abstract of the results was annually published in the 'Proceedings' of the Zoological Society; but it was Dr. Plimmer's intention, if time allowed, to embody the main facts in a text-book on animal pathology, which would have been of the greatest value to those coming after him. One of the most important discoveries he made was the mycotic nature of the jaw-disease to which kangaroos and small antelopes so frequently succumb. He was, I recollect, profoundly interested in the evidence of cancer running in families supplied by a particular stock of wolves, inbred in the Gardens for three generations; and he established, amongst other conclusions, a remarkable correlation between nephritis, enteritis, and affections

of the lungs. In connection with his investigations into the causes of death he was always ready with suggestions and advice to the curators on questions of diet, disinfectants, and other matters relating to the health and welfare of the animals; and all this, it must be added, was done practically as a work of love, the salary he received being rather in the nature of an honorarium, and no adequate remuneration for the time and energy he devoted to the Society's service. The severance of his connection with the Society in 1917 was deeply regretted both by himself and his friends. His mortal illness was probably on him at the time, for he died in the following year at Combe Park, Sevenoaks, the residence of his intimate friend Robert Mond, J.P. His remains were cremated at Golder's Green and his ashes were interred at Shirley, close to his mother's grave. [R. I. Pocock.]

A zealous and hard-working naturalist has been lost to us in the death of William Denison Roebuck on the 15th February last.

He was born in Leeds on the 5th January, 1851, and lived there until he was seventeen years of age, when his parents took a house in Pannal, near Harrogate, as a summer retreat for successive years. At this place our late Fellow began his collecting, which lasted throughout his life; he began by collecting insects, and although he was not a professed entomologist he was intensely interested in that science, and made a point of attending each meeting of the Entomological Section of the Yorkshire Naturalists' Union. In 1877 he published a paper styled "Locusts in Yorkshire," but which far exceeded its title by cataloguing all the known locust flights throughout Britain from 1842 to 1876, which remains the best account even now. He was accustomed to keep records of all papers relating to every order of insect published in various journals referring to Yorkshire and the northern counties generally, and thus gradually amassed an immense body of information, which was available for any author working in special departments of that extensive subject.

A close friend of Mr. Roebuck has remarked upon his possession of a brilliant and rare combination of synthetic and analytic faculties, coupled with great foresight and clear judgment; he had a great gift for administration, and this capacity was turned to account when the Yorkshire Naturalists' Union, the Conchological Society, the Leeds Conchological Club, and the Leeds Naturalists' Field Club were established, as the constitutions of all these associations were drafted by him and have successfully withstood the test of time.

The Yorkshire Naturalists' Union owed its present shape to Mr. Roebuck. He was appointed one of the secretaries in 1876 of the West Riding Consolidated Naturalists' Society, which was an association of various natural history societies of south-west Yorkshire. In 1877, with the help of Mr. G. T. Porritt and the late C. P. Hobkirk, the Yorkshire Naturalists' Union was firmly

established, and shortly afterwards another suggestion of our late Fellow bore ample fruit, that of establishing sections for each branch within the Union, now composed of more than 40 local societies. Mr. Roebuck was President in 1903, and, as the subject for his Address, placed on record a full and authoritative history of the Union and its organ, 'The Naturalist,' from their beginning.

The Fungus Forays were instituted by him, and were so successful that other societies have copied this branch of field-work. The first foray was held in 1881 at Studley and Harrogate; the second took place in 1888, and finally produced their result—'The Fungus Flora of Yorkshire,' by G. Massee and C. Crossland. Mr. Roebuck was honorary secretary and one of the moving spirits of the Union for nearly 30 years, and from 1884 to 1902 sole editor of 'The Naturalist,' with short intervals of collaboration, and to him fell all the arrangements for excursions and business meetings.

In conjunction with Dr. W. E. Clarke he prepared and published 'The Vertebrate Fauna of Yorkshire.' During 1904–06 he travelled in Australia, New Zealand, India, South Africa, and Egypt, with special reference to the study of mollusca designedly or unwittingly introduced by man.

In 1915 the University of Leeds conferred upon him the honorary degree of Master of Science. He was latterly engaged upon the task of placing in glass-topped boxes all freshwater shells in the Linnean collections, and almost the last communication received from him was a detailed report upon this completed work. A sudden paralytic seizure on the evening of 19th January last, when apparently full of health and strength, alarmed his friends: gradually he recovered from this attack, when a second seizure took place, and he gradually sank, dying as above mentioned on the 15th February, 1919, aged 68. His remains were cremated two days later at Lawnswood Cemetery, Leeds, with a large gathering of friends from various societies attending in token of respect. He was elected a Fellow of the Linnean Society on the 1st May, 1884. [B. D. J.]

Richard Williams Harold Row died on February 16th, 1919, from pneumonia, following upon influenza, at the age of 34. He was the son of the late Rev. R. W. Row, of Exeter, and received his early education at Mount Radford School. After spending some time at Exeter University College and the Royal College of Science, South Kensington, he entered the Zoological Department of King's College, London, in 1906. In the following year he took the degree of Bachelor of Science in the University of London, with first class honours in zoology. From that time until the day of his death he was a member of the staff of the Zoological Department of King's College, where his success

as a teacher and investigator soon earned for him the respect and admiration of his students and colleagues. He was elected a Fellow of the Linnean Society in 1908.

As an investigator his chief interest centred in the Sponges, on which group he became an acknowledged authority. His Reports on the Sponges collected by Mr. Cyril Crossland in the Red Sea were published by the Linnean Society in 1909 and 1911. In 1913 the Zoological Society of London, of which he was also a Fellow, published an elaborate memoir on the Classification and Phylogeny of the Calcareous Sponges, written in conjunction with Professor Dendy. He had also undertaken, but unfortunately not completed, a Report on the Sponges of South-Western Australia, for the Hamburg Museum, and, in conjunction with Professor Dendy, a Report on Sponges collected off the north of New Zealand by the 'Terra Nova' Expedition, for the British Museum (Natural History). His work on Sponges, carried on with the greatest enthusiasm and with a keen insight into the phylogenetic principles of classification, was unfortunately interrupted by the war, and, as a piece of very useful war work, he devoted himself to the study of Protozoology, while at the same time continuing to carry on his teaching work at King's College, especially for medical students. His investigations on amœbic dysentery and malaria were prosecuted under the direction of Sir Ronald Ross, and at the time of his death he was in charge of the Malaria Laboratory at the 4th London General Hospital, where he did an immense amount of useful routine work in blood-examination, besides carrying on progressive research on the malaria parasite. It is to be feared that he greatly overworked himself, and this may have had something to do with the rapidity with which he succumbed when attacked by influenza.

In addition to these numerous activities he had for some years been responsible for the section on Porifera in the 'Zoological Record' and had lately undertaken certain other groups for the same publication. He was also a useful member of the University Board of Studies in Zoology, of which he had just been elected Secretary at the time of his death.

Mr. Row's interests were, moreover, by no means confined to zoological studies. He will long be remembered amongst philatelists as a leading—perhaps the chief—authority on the stamps of Siam, and his collection, valued at between two and three thousand pounds, has been presented by his mother to the British Museum.

He had a remarkable gift for systematic investigation, and the loss to zoological science occasioned by his death is a very severe one. Those who had the privilege of knowing him will always think of him as a loyal friend and an inspiring colleague. His memory will be perpetuated at King's College by the Harold Row Endowment for the Promotion of Zoological Research, established by his mother [A. D.]

Henry Worsley Seymour Worsley-Benison was born on the 14th August, 1845, at Clevedon, Somerset, lost his parents when 6 years old, and was brought up by an aunt at Swanage, Dorset. His early education was obtained at private schools at Ringwood and at Brighton. From 1864 to 1867 he studied at New College, Finchley, then, deciding upon a medical career, migrated to University College, Gower Street, the School of Mines, and the hospitals; during this period he came under the guidance of such men as W. C. Williamson, Huxley, Daniel Oliver, and Tyndall, taking his first M.B. examination successfully. He was elected a Fellow of the Linnean Society on the 2nd January, 1869, but soon afterwards, a failure of his health obliged him to give up his medical career, and to confine his attention to botany and zoology. In 1877 he was chosen Lecturer on Botany at Westminster Hospital, which he held for twelve years, and in addition he conducted many successful courses of lectures for the Society for the Extension of University Teaching, and helped to establish several local societies round London. He published two volumes, 'Haunts of Nature' and 'Nature's Fairy-land,' also papers on 'Charles Darwin,' and on the power of movement in plants, both in the 'Journal of Microscopy and Natural Science' in 1886. He lived in many town and country places during his Fellowship, such as Swanage and Reading, besides his London address, finally at Bournemouth, where he died 14th December, 1918, at the age of 73. [B. D. J.]

June 5th, 1919.

Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Henry Herbert Corbett was admitted a Fellow.

The following certificates were read for the second time:—Prof. Vernon Herbert Blackman, F.R.S., Dr. William Thomas Calman, Robert Swainson Hall, Cyril Tenison White, Edwin Ashby, and Dr. Robert Colquhoun McLean.

A certificate in favour of Dr. George Parker Bidder, M.A., was read and ordered to be suspended.

The President announced that he had appointed the following to be Vice-Presidents during the following year, namely, Dr. William Bateson, F.R.S., Mr. Horace W. Monckton, Mr. R. I. Pocock, F.R.S., and Dr. Harold Wager, F.R.S.

Mr. Alfred William Sheppard, Miss Mary Rebekah Norris Holmer, M.A., Miss Theodora Lisle Prankerd, B.Sc., Mr. Edgar Beckett, Dr. Sidney Frederic Harmer, M.A., F.R.S., and Miss Florence Annie Mockeridge, D.Sc., were elected Fellows.

Mr. H. N. Dixon, M.A., F.L.S., then gave an abstract of his paper on "Mosses from Deception Island."

The second paper "On the structure and occurrence of Maxillulæ in the Orders of Insects" was by Miss Alwen M. Evans, M.Sc., and communicated by Dr. A. D. Imms, F.L.S. In the absence of the Author, the Zoological Secretary gave a summary of the paper.

The President commented upon the paper and Dr. Young put a question, which was answered by Mr. Goodrich, F.R.S., Sec.L.S.

The third communication was by Mr. Ernest E. Unwin, M.Sc., "Notes upon the Reproduction of *Asellus aquaticus*," and communicated by the Rev. T. R. R. Stebbing, M.A., F.R.S., F.L.S.; it was read in abstract by the General Secretary.

The General Secretary called attention to the illustrations, which were admirably drawn, and adapted for reproduction as they stood; it was a rare event to be able to praise the illustrations accompanying a paper with such entire approbation.

The General Secretary then exhibited a medallion portrait in bronze of Carl von Linné, hitherto unknown, and wanting in Professor T. Tullberg's "Linnéporträtt," the comprehensive catalogue of Linnean portraits. The base of the head showed the name 'G. Wallis.' George Wallis (1811–91) was an art-teacher in Manchester, London, and Birmingham, and became Keeper of the Art Collections, South Kensington, in 1858, which he retained till the year before his death. Like nearly all plastic representations of Linné, it was made from portraits, as the period of the artist declares. The medallion has been kindly lent for exhibition by Mr. W. J. Wintle, Secretary of the Malacological Society.

Dr. Rendle, F.R.S., Sec.L.S., contributed a few remarks upon the portrait.

A second exhibition by the General Secretary was that of the original seal of the Society, which had been lost sight of since the beginning of the last century. A month previously he received a letter from Mr. John Slade, of Worthing, stating that on winding up the estate of an old gentleman of more than 90 years of age, he found in a deed-box the original seal of the

Society, which he subsequently sent to the Society, and was now on the table.

It was impossible to guess how the seal had left the custody of the Society to be afterwards found in possession of an "illiterate" man; the only entry in the Minutes was in March 1789, "Ordered, that the seal exhibited be engraved." The seal itself was in use until the granting of the Patent of Arms in 1802, for we find an Order in January 1803 for the *immediate* engraving of the present seal, "with the arms of the Society." The exhibitor put forward a possible explanation as to why the original seal was suffered to leave the custody of the Society, to which it had now been returned after more than a century's absence.

A vote of thanks to Mr. Slade was then accorded.

June 19th, 1919.

Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 5th June, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Frederick Ormrod Mosley and Dr. Sidney Frederic Harmer, F.R.S., were admitted Fellows.

Certificates in favour of the following were read and ordered to be suspended:—Miss Vera Adelaide Irwin-Smith, B.Sc., James Robert Matthews, and Miss Beatrice Buckland Taylor.

Prof. Vernon Herbert Blackman, F.R.S., Dr. William Thomas Calman, Robert Swainson-Hall, Cyril Tenison White, Edwin Ashby, and Dr. Robert Colquhoun McLean, were elected Fellows.

The first paper was by Mr. T. A. Dymes, F.L.S., entitled "Notes on the Life-history of the Yellow Flag (*Iris Pseudacorus*, Linn.), with special reference to the seeds and seedlings during their first year."

Lt.-Col. J. H. Tull Walsh and Dr. E. J. Salisbury added further observations, and the Author briefly replied.

Dr. G. H. Rodman showed the egg-case of a spider, *Cyrtarachne tuberculifera*, from Cannes, and explained its structure by lantern-slides. It had been identified by Mr. Eugène Simon; hitherto unknown, it corresponds to those of tropical species of the same genus. (See Abstract on p. 78.)

Mr. S. L. Moore followed with a paper "A Contribution to the Flora of Australia."

Dr. A. B. Rendle pointed out the interest of this paper, and the curious fate which had befallen so many fine collections of Australian plants, as those of Banks and Solander, Robert Brown, and others.

The remaining papers, in the absence of their authors, were read in title:—"Selenariadæ and other Bryozoa," by Mr. A. W. Waters, F.L.S.

Next followed "Studies on some Flagellata," by Dr. E. Penard, F.M.L.S.

The last paper was by Dr. Walter M. Tattersall, and communicated by Prof. W. A. Herdman, F.R.S., F.L.S., "Report on the Stomatopoda and Macrurous Decapoda collected by Mr. Cyril Crossland in the Sudanese Red Sea."

Dr. J. R. Leeson, F.L.S., exhibited *Lemna minor* in flower, under a simple magnification.

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## ABSTRACTS.

### The 'Law of Loss' in Evolution. By Agnes Arber, D.Sc., F.L.S., Fellow of Newnham College, Cambridge.

[Read 7th November, 1918.]

During the last eight years I have been making a special study of aquatic Angiosperms. These plants are of particular interest from the evolutionary standpoint, since there is a firmer basis for speculations as to their ancestry than is generally available in the case of groups concerning whose history we have no fossil evidence. There is good reason to believe that the Flowering Plants were originally a terrestrial stock, and we are thus justified in concluding that the aquatic Angiosperms of the present day are ultimately derivable from ancestors which were land plants. As compared with their terrestrial relatives, the most obvious changes which aquatics have suffered lie in the direction of structural reduction. This is fully recognized, and has indeed become a text-book platitude. The consideration of this reduction, and of some phenomena which seem to be its sequels, has led me to formulate, under the name of the 'Law of Loss,' a certain minor principle which appears to be operative in various phases of plant evolution. *The expression 'Law of Loss' is meant*

*to indicate the general rule that a structure or organ once lost in the course of phylogeny can never be regained; if the organism subsequently has occasion to replace it, it cannot be reproduced, but must be constructed afresh in some different mode*

From its very nature, such a law is not susceptible of formal proof. Its probable validity may, however, be inferred if it can be shown that in a number of cases it opens the door to a rational interpretation of features which are not easily explicable on other grounds. So I propose now to consider certain special instances in which the 'Law of Loss' seems to throw light on the meaning of structural features which would otherwise be obscure, beginning with a case among submerged plants which happened to be one of the first to arrest my attention in this connexion. *Ceratophyllum demersum* and certain species of *Utricularia* are entirely rootless at all stages of their life-history, even the primary root of the seedling being either altogether absent or remaining quite rudimentary. We cannot avoid the belief that these plants are descended from ancestors of the normal Angiospermic type, characterised by possessing a root system; but they have themselves entirely lost the ancestral capacity for producing roots. Nevertheless, in both these unrelated genera, the need for an absorbing organ seems to have re-asserted itself, and to have been met, not by the re-establishment of root formation, but by the development of special subterranean shoots which—though not of the morphological nature of roots—perform a root-like function *. This behaviour in the case of *Ceratophyllum* and *Utricularia* may be interpreted to mean that a plant which has entirely given up root-formation and afterwards again experiences the need of roots, cannot reacquire them, but can only press some existing organ into the service, modifying it as best it may. It is possible that the root-like water-leaves of *Salvinia* indicate a similar history.

As another instance of the working of the 'Law of Loss,' we may take the phylogenetic history of the leaves of the Alismaceæ or Pontederiaceæ—or, indeed, the leaves of any other Monocotyledons which possess 'laminæ.' But whether or no this illustration be accepted, depends upon the standpoint adopted regarding the general morphology of the leaves of Monocotyledons. In a recent paper†, I have dealt at some length with this question and have concluded—following de Candolle‡—that the original type of Monocotyledonous leaf consists either of petiole and leaf-base, or of leaf-base alone, and entirely lacks a lamina. From this point of view, the 'lamina' of a Monocotyledonous leaf, in the cases where it occurs, cannot be interpreted as homologous with the lamina of a Dicotyledon, since, on the Law of Loss, the blade once discarded can never be regained. Professor Henslow§ has propounded the theory that the so-called 'lamina' of those

* Glück, H. (1906).
† Arber, A. (1918).
‡ Candolle, A. P. de (1827).
§ Henslow, G. (1911).

Monocotyledonous leaves which possess a distinct stalk and blade, is merely an expansion of the apical region of the petiole, and that thus the "aerial reticulated leaf-blades of Monocotyledons are not *identical*, but only *imitative* of the fibro-vascular system of an ordinary dicotyledonous leaf." This interpretation, as I have shown in the paper cited*, throws light upon a number of peculiar features in the leaf morphology of Monocotyledons. It suggests a possible cause, for instance, for a certain general similarity of form which pervades the leaf-blades of this Class. Their curiously cumbrous methods of approximating to the compound lamina of the Dicotyledon, and their liability in many cases to be torn to shreds by the wind, also harmonise with the view that they are not true laminæ but mere expansions of the petiole or leaf-sheath apex, in which the shape and structure are determined by the mode and degree of separation of the originally parallel veins. In the paper to which reference has been made, I have also brought forward certain anatomical evidence in support of Henslow's view that the blade of the Monocotyledonous leaf is what I propose to call a 'pseudo-lamina.' If this interpretation be accepted, it affords confirmation of the validity of the 'Law of Loss,' since we have here an instance of a discarded organ being replaced by a modification of another, instead of being reacquired.

Whatever view be taken of the immediate origin of Monocotyledons, they are very generally regarded as descended from a stock which at some period possessed normal secondary thickening; if this hypothesis be accepted, their stem structure may be claimed as exemplifying the 'Law of Loss.' Interfascicular cambium is typically absent in this Class, and those members which have adopted the tree habit—with the correlated necessity for increased girth—have in no case reverted to a typical cambium formed by the union of intrafascicular meristems; they seem, on the contrary to have groped, as it were experimentally, after new methods of secondary thickening.

The pollination methods of submerged Angiosperms may also possibly be regarded as illustrating the 'Law of Loss.' The ciliation of the male gamete in the great group of the Pteridophyta—from which it is supposed that the Flowering Plants are ultimately derived—is associated essentially with aquatic fertilisation; with the adoption of terrestrial life this feature was lost, and is now unknown either in the higher Gymnosperms or the Angiosperms. It might well have been expected that when certain Angiosperms adopted water-life so completely as even to revert to the remotely ancestral habit of submerged fertilisation, they would also simultaneously revert to ciliated sperms associated with a broad stylar canal and open micropyle. Such a trumpet-shaped stigma as that possessed by *Zannichellia* seems, indeed, exactly adapted for the entry of swimming sperms. But no such ciliated Angiospermic gametes have come into existence; those Flowering Plants which are pollinated beneath the water, go through all the processes of

* Arber, A. (1918).

making pollen grains as if for aerial pollination, with merely such slight modifications as will permit them to be carried passively to the stigma by gravity or water currents. It seems that cilia once lost cannot be recovered, even when the circumstances in which they were formerly of use again recur, and the plant has, as it were, to patch up some substitute.

But the application of the 'Law of Loss' is by no means confined to water-plants and Monocotyledons. In the case, for instance, of the Compositæ, Dr. Small* has propounded a theory which is very suggestive in connexion with the present line of thought. He supposes that this dominant family has been ultimately derived from an ancestor among the Lobelioideæ in which the calyx may have been entirely absent. On his view, the pappus of the Compositæ is an independent trichome structure. This is exactly what might have been anticipated on the 'Law of Loss.' The ancestral Composite, being unable to reproduce the discarded foliar members, achieved a more or less equivalent result by the use of material belonging to a totally different morphological category. Probably the initiation of the pappus was a valuable asset in assuring the success of the Compositæ. It is an illustration of the favourable way in which the 'Law of Loss' may sometimes act in evolution, *by closing well-worn paths and thus indirectly encouraging the opening of fresh routes.*

Another case may also be considered, although it involves certain premisses which many botanists might not concede. A well-developed female prothallus characterises the Gymnosperms as well as all the heterosporous Vascular Cryptogams. In the Angiosperms, this prothallial food-tissue has been entirely lost; this loss was possibly connected with a reduction in size of the ovules correlated with the closing of the carpels. It is true that it is held by some that the endosperm of the Angiosperm represents a postponed development of the Gymnosperm prothallus, but there is little evidence in support of this hypothesis. There is much, on the other hand, to recommend Miss Sargant's† theory that the endosperm corresponds to a second embryo which has been "spoiled" and reduced to a short-lived food-tissue by the intrusion of the second polar nucleus into the fusion of the second male nucleus with the upper polar nucleus—the sister of the egg nucleus. If either Miss Sargant's theory, or any other theory which does not treat the endosperm of the Angiosperms and Gymnosperms as equivalent, be accepted, we have a case in which a new structure of entirely different homologies serves the same purpose as a previously existing but now discarded organ. A new acquirement, brought into being in this way to replace a pre-existing structure which has been lost, may sometimes be relatively cumbrous and ill attuned to progressive development (*e.g.* the anomalous secondary thickening of Monocotyledons) or it may, as in the case of the Angiospermic endosperm, prove to be an

* Small, J. (1918) p. 81.
† Sargant, E. (1900).

admirable alternative, which may even confer a new lease of life on the stock which employs it.

If the 'Law of Loss' be accepted as of general application, it furnishes a clue to certain phylogenetic problems. It throws some light, for-instance, on such difficult questions as the interpretation of the flower of *Naias*. If we take the usual view that *Naias* is a highly evolved and reduced member of the Potamogetonaceæ stock, we have to suppose that the immediate ancestor of the genus possessed no perianth, since a true perianth seems to be unknown in this family. According to the 'Law of Loss,' it would be impossible under these circumstances for this genus to evolve a true perianth, and hence we are relieved from the necessity of trying to interpret any of the floral envelopes of *Naias*– which show very little indication of foliar characters—as if they were of perianth nature. We are thus free to suppose that the delicate, membranous floral envelope which *Naias* has evolved, is merely a cupular outgrowth from the receptacle, while the petal-like wings of the stamens in *Potamogeton* may represent another method of replacing the perianth which, having been lost, cannot be resuscitated. Again, it is highly unlikely, on the 'Law of Loss,' that a naked unisexual flower could evolve into a hermaphrodite flower with a perianth; hence the Law accords with the view that the primitive Angiospermic flower was of such a type as that met with among the Ranales, rather than with the opposed theory that it resembled one of the floral forms found among those Archichlamydeæ which were formerly called Apetalæ.

In the case of the Angiosperms we possess at present no fossil evidence throwing light on the phyletic lines within the group, and all our theories on this subject must, for this reason, be based upon comparative morphology alone. The zoologist, on the other hand, is more fortunate, since abundant material has been unearthed in recent years, bearing on the palæontological history of the Vertebrates—a group which occupies a place among animals comparable in some respects with that of the Angiosperms among plants. Some time after I had deduced the Law of Loss from a consideration of the structure of the water-plants living to-day, I learned that zoologists had already arrived, on fossil evidence, at very similar conclusions concerning Vertebrates. The brilliant Belgian palæontologist, Dollo*, enunciated in 1893, in the form of a series of aphorisms, certain laws of evolution which he tells us he reached as a result of studying fossil Vertebrates for a number of years in the Brussels Museum. He states that "L'évolution est discontinue—irréversible—limitée." He explains what he means by irreversibility by asking—and answering in the negative—the question "Un Organisme peut-il retourner (totalement ou partiellement) à un état antérieur, déjà réalisé dans la série de ses ancêtres?" Dollo's dictum regarding the irreversibility of evolution was expanded and confirmed by various workers and in particular by Osborn† in his book on 'The Age of Mammals.' He

* Dollo, L. (1893).

† Osborn, H. F. (1910); see also Woodward, A. Smith (1898), etc.

writes that "A very frequent feature of divergent adaptation is the loss of parts . . . . These lost parts are never reacquired . . . . Nature often resorts to other remedies to repair her losses, namely *to substitution of parts, or to change of function.*"

The most remarkable instances of irreversibility of evolution cited by palæontologists are those associated with alternations of habit: it must be borne in mind in considering such cases that they necessarily involve a large element of hypothesis. Dollo* himself deals particularly with the Marsupials, which he regards as originally arboreal. In the Tree Kangaroo, *Dendrolagus*, there seems reason to believe that reversion to the ancestral arboreal habit has occurred in the course of phylogeny, *after an intervening terrestrial phase*; according to Dollo we have here "un Kangarou qui est retourné vivre dans les arbres." This reversion of habit has been associated with a failure to revert to the ancestral type of arboreal foot-structure with its characteristic opposable thumb or great toe, but, in connexion with the secondary arboreal phase, the claws have become very large and curved, thus serving a similar purpose.

Dollo† has worked out another example from among the Turtles, which is interesting from the botanical standpoint, since it presents an analogy to something that may have occasionally occurred among plants. But the whole subject of the phylogeny of these animals is so obscure that I quote this instance, on which particular stress has been laid by Depéret‡, merely on account of its botanical suggestiveness, while recognising that it may prove to be itself invalid. In the case of the Chelonidæ which live in the sea, the bony case is reduced and its weight lessened by the development of empty spaces or fontanelles. In the Athecæ, to which *Sphargis* (*Dermochelys*), the Leathery Turtle, belongs, the original shield has been entirely lost, but this loss has been compensated by the development of a distinct secondary shield, composed of polygonal dermic plates, superposed upon the rudiment of the first, but not welded to it. According to Dollo, the development of this secondary shield is to be associated with a return to littoral life on the part of a hypothetical ancestor resembling *Psephophorus*. However this may be, it seems at least probable from the work of Case§ that the Leathery Turtle traces its descent through *Protostega* and *Protosphargis*—forms in which the carapace has disappeared, but the secondary shield is not yet developed—back to an ancestor with the normal Chelonian carapace. In other words, the normal carapace once gone could not be reconstituted, but was replaced by a new organ of different origin.

There is no difficulty in imagining that similar alternations of habitat may have occurred among plants in the course of their phyletic history; it is indeed more than probable that future

* Dollo, L. (1899); see also Osborn, H. F. (1910) p. 23.
† Dollo, L. (1901).
‡ Depéret, C. (1907) p. 226.
§ Case, E. C. (1897).

research may disclose the existence of a number of examples. But, so far as I know, the hypothesis of alternating habitats has hitherto only in one case received a botanical application. Dr. D. H. Scott*, many years ago—two years, in fact, before Dollo on the zoological side formulated the 'Law of Irreversibility'—put forward the illuminating suggestion that the explanation of the anatomical peculiarities of the genus *Gunnera* might lie in an ancestral history in which an original terrestrial period, followed by an aquatic phase, has been succeeded by a second terrestrial period. Scott showed that the single stele of the stem of the aquatic genus *Myriophyllum* was comparable with one of the steles of a polystelic *Gunnera*, and more recent work has confirmed the justice of this comparison†. He further suggested that such a terrestrial plant as *Gunnera* might possibly have been descended from an aquatic ancestor anatomically similar to *Myriophyllum*—that is to say, characterised by the condensed stele and lack of secondary thickening which are so often associated with water-life. A descendant of such a reduced aquatic plant can only revert to terrestrial life if it is able to develop an increased supply of vascular tissue; but no longer having a cambial system available for the purpose, it cannot achieve this end except by falling back upon the multiplication of existing steles. Expressing this example in terms of the 'Law of Loss,' we may say that the cambial system once discarded could not be regained, while the expedient of adding to the number of reduced steles represents a device for repairing this irrevocable loss by means of such substitutes as are to hand.

If we accept the views of Samuel Butler so far as to admit that there is at least an *analogy* of a very intimate kind between heredity and unconscious memory, each example of the 'Law of Loss' may perhaps be visualised as representing a lapse or failure of memory. If an organ be lost, the remembrance of it presumably in course of time becomes more and more remote, until finally, even if circumstances renew the need for it, the memory has so entirely faded that the plant cannot, as it were, recall how to reconstruct it. It is thrown, so to speak, on its own resources, and is thus compelled to discover for itself some method of responding upon new lines to the ancient need.

In connexion with the 'Law of Loss' it is important to notice how often the evolutionary tendencies within any particular group, as soon as we are able to analyse them in detail, resolve themselves into phases of reduction. This is obviously true in the special case of the aquatic Angiosperms, but it seems to have a much wider application. The theory, for instance, is now very generally held that Monocotyledons are reduced descendants of a Dicotyledonous stock. In the case, again, of floral evolution

* Scott, D. H. (1891); see also Russow, E. (1875).
† Schindler, A. K. (1904).

within the Dicotyledons, from the generalized types among the Ranales to the most highly differentiated Sympetalæ, one of the chief underlying principles seems throughout to be the reduction of parts*.

With current Mendelian conceptions the 'Law of Loss' harmonises without apparent difficulty. If evolution—at least in what Dr. Guppy† would distinguish as the later "differentiating" or "adaptive" stages—has proceeded by variations due to successive losses of factors, we should certainly expect that the complete loss of an organ might be associated with inability to recall it, even when circumstances seem to put a premium upon its reappearance.‡

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* It is perhaps scarcely necessary to quote authorities for this statement, but we may refer in passing to the "reduction-specialisation" recognised by Church (1908) in his study both of the vegetative and reproductive organs of flowering plants; the tendency to economy of parts repeatedly emphasized by Wernham (1911 and 1912); and the reduction postulated by Čelakovský in a well-known memoir (1894).

† Guppy, H. B. (1919).

‡ Since this paper was read before the Linnean Society, Prof. B. Petronievics has published a full analysis and critical study of all that part of Dollo's work which relates to the Law of Irreversibility ("Sur la Loi de l'Évolution Irréversible." Sci. Prog. vol. xiii. 1919, pp. 406–419). The Zoological Secretary has also kindly called my attention to a paper by D. Keilin in support of Dollo's Law ("La loi d'irréversibilité de l'évolution (Dollo), vérifiée par l'étude des larves d'insectes," Bull. de la Soc. Zool. de France, vol. xl. 1915, pp. 38–43. For further considerations relating to the Law of Loss, see Arber, A. "On Atavism and the Law of Irreversibility," Amer. Journ. Sci. vol. xlviii. pp. 27–32, 1919.

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## The Egg-case of a Spider from Cannes.

By Dr. G. H. Rodman.

[Read 19th June, 1919.]

Some months ago Mr. J. C. Warburg gave me a few examples of egg sacs of spiders collected by him at Cannes (Alpes maritimes) 20 years ago. Amongst them were several that I tried to name, and it is one of these that supplies me with the material for my communication this afternoon. I bring it before the notice of this Society with the idea of placing on record what I have been able to find out about it.

2. The three spindle-shaped egg-sacs (I produce the actual specimen), measuring about 1 inch in length, are of a straw-colour, severally attached by a fine strand, about $1\frac{1}{2}$ inches long, of silken material to a small branch of some tree (*Mimosa* ?). (Fig. A on page 80.) One of the egg-sacs shows two minute circular punctures, possibly the result of attention by an Ichneumon fly. (See figure B on page 80.)

3. I sacrificed one sac and cut out a portion of the sac-wall. Microscopically, I found it to consist of the typical silk employed

by spiders in the formation of the protective covering of their eggs. The strands were arranged in circular sweeps so characteristic of the silk found in the egg-sacs of spiders.

4. A slide obtained from the egg-sac of the house-spider at a magnification of 100 diameters indicates the circular sweep of the silk fibres and serves to illustrate my remarks.

From the appearances presented I was led to the conclusion that I had the product of a spider to deal with.

5. In addition the contents of the sac consisted of the usual type of silk we find surrounding the eggs and the remains of empty egg-shells and dried-up spiders.

I could find no reference to any spider egg-sac at all like it.

Messrs. R. I. Pocock and Richard Hancock were unable to identify it. I met with the same experience at the Natural History Museum, but on carefully looking through the cabinet of spider egg-sacs there I found a single identical egg-sac which showed a precisely similar puncture to those shown in my specimen. It was unnamed, and I could learn nothing about where it was found.

I was referred by the authorities of the Museum to Monsieur Eugène Simon of Paris, who, on April 10, 1919, wrote me as follows:—"It is perhaps the egg-sac of *Cyrtarachne tuberculifera* (E. S.). The egg-sac of this is unknown, and the supposition is formed on analogy with that of the tropical species of the same genus."

Simon's description of this Argiopod states that it is found in Africa, Asia, Japan, Malaya, and on the shores of the Western Mediterranean.

6. It may be of interest if I call attention to one or two points suggested by my first slide.

We have the egg-sacs of *Cyrtarachne tuberculifera*. To the left of these possibly the egg-sac of *Zoropsis spinimanus* (Dufour). Below we have the outer and inner envelope of the egg-sac of *Drassodes hypocritica*, and to the left of these the cocoon of the nymphal stage of some Lepidopterous insect. The cocoon has been formed by the incurving of a leaf (*Arbutus*?), surrounded by strands of brown Lepidopterous silk. I show a slide of this silk so markedly different from the silk employed in the construction of the egg-sacs of spiders. The trellis-like arrangement of the strands are a point of distinction. (See figure B on page 80.)

7. This feature is shown in the silk of the cocoon of perhaps one of the best-known examples, that of the silkworm *Bombyx mori*. My photomicrograph of this at a magnification of 50 diameters has been obtained by direct and not transmitted light.

A

B

A. Egg-sacs of *Cyrtarachne tuberculifera*, natural size.
B. Various egg-sacs from Cannes, as described in paragraph 6 on page 79.

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1862.

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Sir John Lubbock, Bt. (afterwards Lord Avebury).
Portrait of Carl von Linné, ascribed to M. Hallman.
Philip Henry Gosse, Esq.: towards cost of illustrating his paper, £25.
Royal Society: Grant in aid of Mr. P. H. Gosse's paper, £50.
Sophia Grover, Harriet Grover, Emily Grover, and Charles Ehret Grover: 11 letters from Carl von Linné to G. D. Ehret.

1885.

Executors of the late George Bentham, £567 11*s.* 2*d.*
Subscription portrait of George Busk, by his daughter Marian Busk.

1886.

A large selection of books from the library of the late Dr. Spencer Thomas Cobbold (a bequest for a medal was declined).
Sir George MacLeay, Bt.: MSS. of Alexander MacLeay and portrait of Rev. William Kirby.

1887.

William Davidson, Esq.: 1st and 2nd instalments of grant in aid of publication, £50.
Francis Blackwell Forbes, Esq., in aid of Chinese Flora, £25.

1888.

The Secretary of State for India in Council: Grant in aid of publication of results of the Afghan Boundary Delimitation Expedition, £150.
Dr. J. E. T. Aitchison, towards the same, £25.
Trustees of the Indian Museum: Mergui Archipelago report, for publication in Journal, £135.
Dr. John Anderson, for the same, £60.
Wm. Davidson, Esq.: 3rd and last instalment, £25.
Sir Joseph Hooker: (1) Series of medals formerly in possession of George Bentham; (2) Gold watch, key, and two seals which belonged to Robert Brown.

1889.

Bronze copy of model for Statue of C. von Linné, by J. F. Kjellberg: presented by Frank Crisp, Esq.

1890.

The Secretary of State for India in Council: Grant for Delimitation Expedition report, £200.

Oak table for Meeting Room, presented by Frank Crisp, Esq.

Subscription portrait of Sir Joseph Dalton Hooker, K.C.S.I., by Hubert Herkomer, R.A.

Executors of the late John Ball, Esq.: a large selection of books.

An anonymous donor, £30.

Colonel Sir Henry Collett, K.C.B., towards the publication of his Shan States collections, £50.

1891.

Subscription portrait of Sir John Lubbock, Bt. [Lord Avebury], by Leslie Ward.

George Frederick Scott Elliot, Esq., towards cost of his Madagascar paper, £60.

1892.

Dr. Richard Charles Alexander Prior: for projection lantern, £50.

1893.

The Executors of Lord Arthur Russell: his collection of portraits of naturalists.

Electric light installation: cost borne by Frank Crisp, Esq.

1894.

Algernon Peckover, Esq.: Legacy, £100 free of Duty.

Miss Emma Swan: "Westwood Fund," £250.

1896.

Clock and supports in Meeting Room, presented by Frank Crisp, Esq.

1897.

William Carruthers, Esq.: Collection of engravings and photographs of portraits of Carl von Linné.

Royal Society: Grant towards publication of paper by the late John Ball, £60.

Subscription portrait of Professor George James Allman, by Marian Busk.

### 1898.

Sir John Lubbock, Bt.: Contribution towards his paper on Stipules, £43 14*s.* 9*d.*

Royal Society: Contribution towards F. J. Cole's paper, £50.

" " " " Murray & Blackman's paper, £80.

" " " " Elliot Smith's paper, £50.

" " " " Forsyth Major's paper, £50.

### 1899.

Alfred Charles William Harmsworth, Esq. [afterwards Lord Northcliffe]: Contribution towards cost of plates, £43.

Royal Society: Contribution towards Mr. R. T. Günther's paper on Lake Urmi, £50.

### 1901.

Hon. Charles Ellis, Hon. Walter Rothschild, Frank Crisp, Esq., F. D. Godman, Esq., and the Bentham Trustees: The Correspondence of William Swainson.

Royal Society: Contribution towards Mr. F. Chapman's paper on Funafuti Foraminifera, £50.

Prof. E. Ray Lankester: Contribution towards illustration, £30 5*s.*

Portrait of Dr. St. G. J. Mivart, presented by Mrs. Mivart.

### 1903.

Royal Society: Contribution toward Dr. Elliot Smith's paper, £50.

Legacy from the late Dr. R. C. A. Prior, £100 free of duty.

Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.

B. Arthur Bensley, Esq.: Contribution to his paper, £44.

### 1904.

Royal Society: Grant in aid of third volume of the Chinese Flora, £120.

Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.

The same: Bulliard (P.). Herbier de la France; Dictionnaire; Histoire des plantes vénéneuses; Champignons, in 10 vols. Paris, 1750–1812.

### 1905.

Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.

Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

## 1906.

Royal Society: Second grant towards 'Biscayan Plankton,' £50.
Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.
Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Krafft the elder, and A. Roslin, both by Jean Haagen.

## 1907.

Royal University of Uppsala: Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).
Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.
The Trustees of the Percy Sladen Memorial Fund: First grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

## 1908.

Prof. Gustaf Retzius: Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby: the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.
Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S.: Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

## 1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.
Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Protoplasm.

## 1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.
Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.
Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0*s.* 6*d.*
Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.
The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's Researches in the Indian Ocean, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the Indian Ocean Researches, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15*s*. 2*d*.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.

The same: First Donation towards the fifth volume, £60.

1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating Oenotheras, £60.

Sir Frank Crisp, Bt., Wallichian Cabinets, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.

Miss Foot: Cost of illustration of her paper on *Euschistus*.

The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.

The same: First Donation towards the sixth volume, £190.

1915.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.

Miss Foot: Cost of second paper on *Euschistus*, £32 10*s*.

Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.

The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.

Miss Marietta Pallis: Instalment of cost of her paper on Play, £30.

Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.

Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

## 1916.

Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.

Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.

Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.

The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.

The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.

Miss Marietta Pallis: Balance of cost of her paper on Plav, £90 16*s.* 6*d.*

Sir Frank Crisp, Bt.: Phototypèd copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

## 1917.

British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.

The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.

Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891–1901. 17 vols. sm. fol.

## 1919.

Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.–xl. (1884–1912) and the Botanic entries in the 'Proceedings' for the same period.

# INDEX TO THE PROCEEDINGS.

## SESSION 1918–1919.

*Note.*—The following are not indexed :—The name of the Chairman at each meeting; speakers whose remarks are not reported; and passing allusions.


Abstracts of Papers, 70–79.
Accounts, 19–21.
Additions to Library, 81–100.
Adkin, B. C., proposed, 16.
Ahmed, S. K., deceased, 16.
Albino Mutant of *Botrytis cinerea*, Pers. (Brierley), 14.
Amos, H. R., Wheat-breeding in the Argentine, 13.
Andy, S. P., deceased, 16.
Anniversary Meeting, 16.
Arber, Mrs. A., communication by (Arber & Lawfield), 2; The "Law of Loss" in Evolution, 2; abstract, 70; Councillor retired, 18.
Arber, Dr. E. A. N., deceased, 16; obituary, 39; bibliography, 44.
—— and F. W. Lawfield, On the External Morphology of the Stems of *Calamites*, with a Revision of the British Species of *Calamophloios* and *Dictyocalamites*, 2.
Arden, S., withdrawn, 17.
Argentine, Wheat-breeding in the (Amos), 13.
Ascroft, R. W., elected, 5; proposed, 2.
*Asellus aquaticus*, Reproduction of (Unwin), 68.
Ashby, E., proposed, 16, 67.
Associates, vacancy in List announced, 5; W. R. Sherrin, adm. Assoc. 11; elected, 9; proposed, 6.
Auditors elected, 13.
Australia, Flora of, Contrib. (Moore), 70.

Bagnall, J. E., deceased, 5, 17.
Baker, E. G., elected Councillor, 17; exhibited drawings of British plants by Miss Beatrice O. Corfe, 9.
Baker, W. H., withdrawn, 17.
Balfour, Prof. I. Bayley, Linnean Medal presented to, 37; acknowledgment, 39.
Balston, W. E., deceased, 16; obituary, 48.
Bancroft, C. K., deceased, 16.
Barnes, R. H., deceased, 16.
Barton, W. C., admitted, 14; elected, 13; proposed, 9.
Bateson, Dr. W., appointed V.-P., 68; elected Councillor, 17; communication by (Amos), 13.
Beckett, E., elected, 68; proposed, 15.
Benefactions, 101–111.
Benison, *see* Worsley-Benison.
Benson, Prof. Margaret, elected Councillor, 17.
Bickford, E. J., removed from List, 17.
Bidder, Dr. G. P., proposed, 67.
Bigby, Miss G., withdrawn, 17.
Billinghurst, H. G., elected, 15; proposed, 11.
Blackman, Prof. V. H., elected, 69; proposed, 16, 67.
Botanical Secretary (Dr. A. B. Rendle), elected, 18.
*Botrytis cinerea*, Pers, Albino Mutant (Brierley), 14.
Bridgman, F. J., deceased, 16; obituary, 48.
Brierley, W. B., admitted, 6; elected, 5; proposed, 2; an Albino Mutant of *Botrytis cinerea*, Pers., 14.
Bristol, Miss M., Review of the Genus *Chlorochytrium*, Cohn, 3.
British Mites, drawings exhibited (Soar), 4; British plants, drawings by Miss B. O. Corfe, exhibited, 9.

Brown, N. E., A new species of *Lobostemon* in the Linnean Herb., 7; old and new species of *Mesembryanthemum*, 7.
Browne, E. T., elected Councillor, 17.
Bryozoa (Waters), 70.
Bullock-Webster, Rev. Canon G. R., admitted, 2; appointed Scrutineer, 17, 18.
Burne, R. H., elected Councillor, 17; exhibited preparations by the late Prof. C. Stewart, of sound-producing organs in Invertebrates and Fishes, 8.
Bye-Laws, proposed alterations read, 7, 8; adopted, 9.

*Calamites*, External Morphology of the Stems of, &c. (Arber and Lawfield), 2.
*Calamophloios*, *see* Arber and Lawfield.
Calman, Dr. W. T., elected, 69; proposed, 16, 67.
Candolle, Dr. A. C. P. de, death announced, 8, 17; obituary, 51.
Cannes, *see* Rodman, Dr. G. H.
Cash Statement received and adopted, 16; as audited, 19–20.
Cavanagh, B. F., removed from List, 17.
Cavers, Dr. F., removed from List, 17.
Cemeteries, military, horticultural work in, in France (Hill), 5–6.
Chaudhuri, B. L., removed from List, 17.
*Chlorochytrium*, Cohn, Review of the Genus (Bristol), 3.
Colour-sense in Wasps (Wager), 10; in Lepidoptera (Eltringham), 10.
Compositæ, Pappus in (Small), 15.
Corbett, H. H., admitted, 67; elected, 9; proposed, 6.
Corfe, Miss Beatrice O., *see* Baker, E. G.
Cornish, F., elected, 9; proposed, 6.
Council, altered Bye-Law as to election of, 7, 9.
Councillors elected and retired, 1, 17.
Crisp, Sir Frank, Resolution passed upon his decease, 14; deceased, 16; obituary, 49.
Crossland, Dr. C., withdrawn, 17; *see* Tattersall.
Crow, W. B., admitted, 9.
Curtis, Miss K. M., admitted, 13; elected, 7; proposed, 4.
*Cyrtarachna tuberculifera*, *see* Rodman, Dr. G. H.

Deaths recorded, 17.
Decapoda, Macrurous, *see* Stomatopoda.
Deception Island, Mosses from (Dixon), 68.
Denham, H. J., proposed, 16.
*Dictyocalamites*, *see* Arber and Lawfield.
Dixon, H. N., Mosses from Deception Island, 68.
Drummond, J. M. F., admitted, 14; Flora of a small area in Palestine, 15.
Dunn, S. T., withdrawn, 17.
Dymes, T. A., Notes on the Life-history of the Yellow Flag (*Iris Pseudacorus*), 69.

Edwards, S., elected Councillor, 17; elected Auditor for the Council, 13.
Egg-case of a spider from Cannes, exhibited (Rodman), 69; abstract, 78.
Elections reported, 17.
Eley, C. C., admitted, 5; elected, 4; proposed, 2.
Eltringham, Dr. H., Colour-sense in Lepidoptera, 10.
Evans, Miss A. M., On the Structure and Occurrence of Maxillulæ in the Orders of Insects, 68.
Evolution, "Law of Loss" in (Arber), 2; abstract, 70.
Exogoneæ, On the (Haswell), 4.

Farmer, Prof. J. B., elected Councillor, 17.
Flagellata, Studies of some (Penard), 70.
Flora of Australia, Contrib. (Moore), 70; Flora of a small area in Palestine (Drummond), 15.
Foreign Members, death (de Candolle) announced, 8; Dr. J. N. F. Wille el. For. Memb., 15; proposed, 9.
Formalin vapour, Plant-specimens preserved with (Rathbone), 12.
Forrest of Bunbury, Baron, deceased, 16; obituary, 53.
Foweraker, C. E., admitted, 13; elected, 9; proposed, 6.
France, *see* Hill, A. W.
Frog, A fatherless, exhibited (Goodrich), 3.
Fry, Sir E., deceased, 16; obituary, 53.

Garland, *see* Lester-Garland.
General Secretary, Annual Report, 16; elected (Dr. B. D. Jackson), 18; exhibited the foll.:—engraving of Carl von Linné, presented, 4; letters

from Gov. Tulbagh, 4; hitherto unknown medallion portrait of Carl von Linné by G. Wallis, 68; the original seal of the Society, 68.
Gibson, G. W., elected, 4; proposed, 2.
Gilchrist, Dr. J. D. F., the post-Puerulus Stage of *Jasus lalandii* (Milne-Edw.), Ortmann, 14.
Godman, F. DuCane, deceased, 16; obituary, 54.
Goodrich, E. S., elected Councillor, 17, and Zoological Secretary, 18; A fatherless Frog, with remarks on Artificial Parthenogenesis, 3.
Gray, G. G., withdrawn, 17.
Gray, H. N., elected, 3.
Greaves, H., elected, 9; proposed, 6.
Groves, W. E., admitted, 9.

Hall, *see* Swainson-Hall.
Harmer, Dr. S. F., admitted, 69; elected, 68; proposed, 15.
Harrington, Mark W., deceased, 16.
Haswell, Prof. W. A., The Exogoneæ, 4.
Hatton, Rev. C. O. S., elected, 5; proposed, 2.
Hiley, W. E., admitted, 5.
Hill, Capt. A. W., on horticultural work in military cemeteries in France, 5–6.
Holmer, Miss M. R. N., elected, 68; proposed, 13.
Holtze, M., removed from List, 17.
Hurry, Miss G. B., admitted, 5; elected, 4; proposed, 2.
Hutchinson, J., admitted, 5; elected, 4; proposed, 2.

Imms, Dr. A. D., communication by (Evans), 68.
Insects, Maxillulæ of, Structure and Occurrence (Evans), 68.
*Iris Pseudacorus*, Notes on its Life-history (Dymes), 69.
Irwin-Smith, Miss V. A., proposed, 69.

Jackson, Dr. B. D., elected Councillor, 17, and General Secretary, 18.
*Jasminum malabaricum*, Wight, Variation in Flowers (Mann), 14.
*Jasus lalandii* (Milne-Edw.), Ortmann, post-Puerulus stage of (Gilchrist), 14.

Kennard, A. S., and B. B. Woodward, Linnean species of British Non-Marine Mollusca, with Notes on the specimens in the Linnean collection, 3.
Kestner, P., elected, 9; proposed, 6.
Knipe, H. R., deceased, 16.
Kunadiyaparawita Mountain, Visit to, with list of plants (Lewis), 11.

Lacaita, C. C., elected Councillor, 18.
Lace, J. H., deceased, 16; obituary, 56.
Laurie, R., deceased, 16.
"Law of Loss" in Evolution (Arber), 2; abstract, 70.
Lawfield, F. W., *see* Arber, E. A. N.
Lawson, Miss D., admitted, 16; elected, 15; proposed, 11.
Leeson, Dr. J. R., exhibited *Lemna minor* in flower, 70.
*Lemna minor* in flower, exhibited (Leeson), 70.
Lepidoptera, Colour-sense in (Eltringham), 10.
Lester-Garland, L. V., admitted, 2.
Lewis, F., Notes on a visit to Kunadiyaparawita Mountain, with a list of Plants, 11.
Librarian's Report, 17.
Library, Additions and Donations, 81–100.
Limitation of number of Fellows by Bye-Law, 7, 9.
Linné, Carl von, an engraving of, exhibited (Gen. Sec.), 4; hitherto unknown medallion portrait of, by G. Wallis, exhibited (Gen. Sec.), 68.
Linnean Herb., new species of *Lobostemon* in (Brown), 7.
Linnean Medal, presented to Prof. I Bayley Balfour, 37.
Linnean species of British Non-Marine Mollusca, &c. (Kennard & Woodward), 3,
Lister, Miss G., Councillor retired, 18.
*Lobostemon*, new species of, in the Linnean Herb, (Brown), 7.
Loder, G. W. E., elected Councillor, 18; elected Auditor for the Fellows, 13.
Löfgren, A., deceased, 16; obituary, 57.

McLean, Dr. R. C., elected, 69; proposed, 16, 67.
McLuckie, J., elected, 9; proposed, 6.
McMahon, Sir A. H., withdrawn, 17.
Mann, Dr. H. H., Variation in Flowers of *Jasminum malabaricum*, Wight, 14.
Matthews, J. R., proposed, 69.
Maxillulæ of Insects, Structure and Occurrence (Evans), 68.
Medal, Linnean, presented to Prof. I. Bayley Balfour, 37.

Meiklejohn, J. W. S., deceased, 16; mentd., 4.
*Mesembryanthemum*, old and new species of (Brown), 7.
Mites, British, coloured drawings exhibited (Soar), 4.
Mockeridge, Miss F. A., elected, 68; proposed, 15.
Mollusca, Linnean species of British Non-Marine, &c. (Kennard & Woodward), 3.
Monckton, H. W., appointed V.-P., 68; elected Councillor and Treasurer, 18.
Moore, S. L., Contribution to the Flora of Australia, 70.
Mosley, F. O., admitted, 69; elected, 15; proposed, 11.
Mosses from Deception Island (Dixon), 68.
Mudd, C., removed from List, 17.

Nicholls, Dr. G. E., Councillor retired, 18.
Nicholson, C. S., deceased, 16.
Nicholson, W. E., admitted, 14; elected, 9; proposed, 6.
Noel, Miss E. F., appointed Scrutineer, 1.
Norman, Rev. Canon A. M., deceased, 16; obituary, 58.

Obituary Notices, 39–67.
Orchids, drawings exhibited (Stephenson), 8.

Palestine, *see* Drummond.
Panday, P. J., admitted, 11; elected, 9; proposed, 6.
Pappus in Compositæ (Small), 15.
Parthenogenesis, Artificial, *see* Goodrich.
Paulson, R., elected Auditor for the Fellows, 13.
Penard, Dr. E., Studies of some Flagellata, 70.
Penrose, G., removed from List, 17.
Plant-specimens preserved with formalin vapour (Rathbone), 12.
Plimmer, Prof. H. G., deceased, 1, 16; obituary, 60.
Pocock, R. I., appointed V.-P., 1, 68; elected Councillor, 18.
Prain, Sir D., Councillor retired, 18; "The Relationship of the existing Statutes of the Society to our present needs" (Presidential Address), 22–37; on *Terminalia Catappa* on Barren Island, Andaman group, 11.
Prankerd, Miss T. L., elected, 68; proposed, 13.
President (Sir D. Prain), appointed Scrutineers, 1, 17, 18; appointed Vice-President, 1; read proposed alterations in the Bye-Laws, 7–9; presented Linnean Medal to Prof. I. Bayley Balfour, 37.
—— (Dr. A. Smith Woodward), elected, 18; appointed Vice-Presidents, 68.
Presidental Address, 22–37.

Rathbone, Miss M., on preserving plant-specimens with formalin vapour, 12.
Removals by Council from List, 17.
Rendle, Dr. A. B., elected Botanical Secretary and Councillor, 18.
Reproduction of *Asellus aquaticus* (Unwin), 68.
Robotham, F. E., admitted, 5; elected, 4; proposed, 2.
Rodman, Dr. G. H., exhibited egg-case of a spider, *Cyrtarachne tuberculifera* from Cannes, 69; abstract, 78.
Roebuck, W. D., deceased, 16; obituary, 64.
Rothschild, Lord, moved vote of thanks for Presidential Address, 37.
Row, R. W. H., deceased, 16; obituary, 65.
Rushton, W., admitted, 14; elected, 13; proposed, 6.
Russell, H. J. H., admitted, 6; elected, 5; proposed, 2.
Ryan, G. M., admitted, 16.

Salmon, C. E., exhibited water-colour drawings of Orchids and Sea-Anemones, by T. A. Stephenson, 8.
Sanderson, A. R., elected 4; proposed, 2.
Scott, Dr. D. H., elected Councillor 18
Scott, Hugh, withdrawn, 17.
Scrutineers appointed, 1, 17, 18.
Sea-Anemones, drawings exhibited (Stephenson), 8.
Seal of the Society, original, exhibited (Gen. Sec.), 68.
Secretaries elected, 18.
Selenariadeæ and other Bryozoa (Waters), 70.
Sheppard, A. W., elected, 68; proposed, 13.
Sherrin, W. R., adm. Assoc., 11; elected, 9; proposed, 6.
Shrivell, F. W. E., removed from List, 17.

Sim, T. R., withdrawn, 17.
Small, J., appointed Scrutineer, 1; On the pappus in Compositæ, 15.
Smith, *see also* Irwin-Smith.
Smith, Miss A. L., elected Councillor, 18.
Smith, Miss M. E. B. (Clerk, Linn. Soc.), Vote of Condolence passed, 4.
Smith, W. W., admitted, 5.
Soar, C. D., exhibited coloured drawings of British Mites, 4.
Sound-producing organs in Invertebrates and Fishes (Burne), 8.
Southee, E. A., proposed, 16.
Sprague, T. A., appointed Scrutineer, 17, 18.
Stead, D. G., withdrawn, 17.
Stebbing, Rev. T. R. R., communication by (Unwin), 68.
Stephenson, T. A., *see* Salmon, C. E.
Stewart, Prof. C., *see* Burne.
Stomatopoda and Macrurous Decapoda coll. in the Sudanese Red Sea (Tattersall), 70.
Sudanese Red Sea, *see* Tattersall.
Sutton, A. W., elected Councillor, 1, 18; elected Auditor for the Council, 13.
Swainson-Hall, R., elected, 69; proposed, 16, 67.

Tagart Fund, new volume purchased from, exhibited (Treasurer), 3.
Tattersall, Dr. W. M., Report on the Stomatopoda and Macrurous Decapoda coll. by Mr. C. Crossland in the Sudanese Red Sea, 70.
Taylor, Miss B. B., proposed, 69.
*Terminalia Catappa*, *see* Prain, Sir D.
Thompson, A. R., proposed, 16.
Thompson, Dr. J. M., elected, 4; proposed, 2.
Thompson, W. W., deceased, 16.
Thomson, Miss M. R. H., proposed, 16.
Treasurer, Annual Report, 16, 19–20; elected (H. W. Monckton), 18; exhibited new volume purchased from Tagart Fund, 3.
Tulbagh, Gov., letters exhibited (Gen. Soc.), 4.
Turnbull, A. H., deceased, 16.

Unwin, E. F., Notes upon the Reproduction of *Asellus aquaticus*, 68.

Variation in Flowers of *Jasminum malabaricum*, Wight (Mann), 14.
Vice-Presidents appointed, 1, 68.
Vincent, Dr. R., removed from List, 17.

Wager, Dr. H., elected Councillor, 18; appointed V.-P., 68; On the Colour-sense in Wasps, 10.
Wallis, G., *see* Linné, Carl von.
Walsh, Lt.-Col. J. H. T., elected Councillor, 18.
Wasps, Colour-sense in (Wager), 10.
Waterhouse, F. H., deceased, 17.
Waters, A. W., Selenariadeæ and other Bryozoa, 70.
Watts, Rev. W. W., elected, 9; proposed, 9.
Webster, *see* Bullock-Webster.
Wernham, H. F., removed from List, 17.
West, Prof. G. S., communication by (Bristol), 3.
Wheat-breeding in the Argentine (Amos), 13.
Wheelwright, Miss E. G., admitted, 14.
White, C. T., elected, 69; proposed, 16, 67.
Wilkinson, W. A., admitted, 5; elected, 4; proposed, 2.
Wilkinson, W. H., deceased, 16.
Wille, Dr. J. N. F., el. For. Memb., 15; proposed, 9.
Williams, F. N., appointed Scrutineer, 17, 18.
Withdrawals, 17.
Woodward, Dr. A. Smith, elected President and Councillor, 18.
Woodward, B. B., *see* Kennard, A. S.
Worsdell, W. C., appointed Scrutineer, 1; withdrawn, 17.
Worsley-Benison, H. W. S., deceased, 16; obituary, 67.
Wright, Rev. L. S., deceased, 16.
Wright, Lt. W. E., admitted, 8; elected, 4; proposed, 2.

Yermoloff, Sir N., admitted, 4; elected, 3.

Zoological Secretary (E. S. Goodrich), elected, 18.

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

PUBLICATIONS : Session July 1918–July 1919

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